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Cooking by Thermal Storage.

FROM quite early days, the storage of energy in the form of heat has been practised by electrical engineers to meet various conditions—the combustion of refuse in the daytime, when the demand for electricity occurred mainly in the evening; the smoothing-out of the irregular deliveries of exhaust steam from colliery winding engines; the heating of water during the night, for use in the daytime—and it cannot be doubted that, when carried out on scientifically correct lines, it is a useful method and more efficient than might appear probable. In point of fact, when the last-named application is in question, a high degree of efficiency is not essential to success; energy supplied at night has practically no capital charges to bear, and can be profitably supplied at such a low price per kWh that it may readily prove economically sound to waste a little heat rather than to spend more money on lagging.

We have pointed out, in season and out of season, that the greatest factor in reducing the sale price of electricity is a high load factor, and we have urged supply engineers not only to look out for, but to create, ways and means for filling up the hollows in their daily load curves. With a 100 per cent. load factor, even the smallest electricity works could not fail to supply cheap electricity, and securing a steady night load is perhaps the very best aid to that desirable end, because if that difficult period can be satisfactorily dealt with, there will certainly be little trouble in selling the resulting "cheap units" in the daytime.

As Prof. S. Parker Smith showed in his paper before the Institution of Electrical Engineers last session (a paper which, we believe, has been read at about 40 meetings), the Corporation of Glasgow, on the advice of Mr. R. J. Mitchell, supplies electricity for heating water during the night at ¾d. per kWh, and at that price electricity can compete successfully with other sources of heat. Several other open-minded supply authorities offer similar terms, but some of the biggest concerns are still unable to bring themselves into line with modern practice in this respect. Yet it cannot be denied that any modern generating station can supply a fixed load during most of the night hours at

a profit for less than ½d. per kWh; nor can it be doubted that there would be a ready demand for it. Why, then, wait?

The Stockholm electricity supply authorities are not amongst the Rip van Winkles of the industry; as Mr. R. Borlase Matthews tells us, at the Sectional Meeting of the World Power Conference at Basle, a novel system of cooking in the daytime with electrical energy stored up during the night was described, and we think the scheme deserves the closest attention. The fact that it embodies a complete departure from the stereotyped pattern of electric cooker—which hitherto has followed the lines of the gas cooker—is a point in its favour: new methods call for new means. On the other hand, the thermal-storage cooker reminds us of the hay-box, which also depends on the storage of heat, and really is based on the most primitive mode of cookery practised since man began to use fire—another example of reversion to early methods.

We should not omit to mention the "Therol" water-heater of Messrs. Spagnoletti, described in the ELECTRICAL REVIEW of September 10th, 1909, p. 415, as there is a notable resemblance between this and the new Swedish cooker. Mr. Spagnoletti's device consisted of a 2-cwt. block of cast-iron, which was heated by a small continuous current, up to a maximum temperature of 500 deg. F. The block was surrounded by a tank of water (heat-insulated from the block), and the warm water passed through a spiral tube embedded in the block on its way to the outlet, becoming superheated steam, which was mixed in a special valve with cold water, giving water of any desired temperature. It was proposed that this heater should be connected to the mains without a meter, thus having a 100 per cent. load factor or connected by a two-way switch with a cooker, or should be cut off during peak hours, thus improving the general load factor. Its likeness, in principle, to the Swedish cooker is evident, but of course the latter is more highly developed. We hope that the new device will prove capable of adaptation to the requirements of the electricity supply industry and of the consumer in this country.

Those who manufacture the type of electric cooker which is already so widely used need not fear that their business will suffer: on the contrary, it is to their advantage that every possible means of popularising cooking by electricity shall be brought into operation. There is ample scope for all.

The Future of Tramways.

THE papers and discussions at the Municipal Tramways Conference, which was held last week at Liverpool, were directed almost entirely to the question, expressed or implied, of motor-'bus competition and the future of street transportation. It is an old story, but none the less true, that the electric tramways have inherited from their predecessors, the horsed tramways, burdens which might—or might not—have been justified when the Tramways Act was passed in 1870, but which are certainly inequitable and oppressive at the present day, under wholly different conditions. As Mr. A. Baker remarked, if the competitors of the tramways were subjected to the like demands, they could not live on tramway routes; even after allowing for the present taxation of the London General Omnibus Company, it would have to meet a net additional cost of half a million sterling per annum.

Those who advocate the "scrapping of the trams," ignoring the financial burdens of capital charges and road maintenance that would immediately fall upon the shoulders of the ratepayers, with no revenue to meet them, as well as the unremunerative outlay for removing the rails and line equipment, forget also that the streets would become more congested with traffic than ever before. The congestion in London is far worse where there are no tramcars than where they run, and during the general strike the conditions were almost unbelievable at the rush hours. The moral, well applied by many of the speakers at the Conference, is that for moving heavy traffic on the streets with the minimum of congestion, the tramcar is unrivalled; the Advisory Committee for London Traffic has declared that tramways are essential to the transport service of the Metropolis, and in the great provincial centres the same opinion is held by the traffic authorities.

We would not ask favours for the electric tramways; we ask no more than fair play and just dealing. Then the tramways will again prove economically sound and prosperous. As things are, the motor-'buses are heavily subsidised at the expense of the tramways.

At the luncheon celebrating the opening of the new extensions to the London underground electric railways, reported in our "Notes" columns to-day, Lt.-Col. Moore-Brabazon mentioned the undesirability of the Government's using the Imperial taxation for subsidising transport, which, he said, must pay its way; unrestricted competition was not helpful to the modern traffic problems, but if all the transport sections worked together there would be room for them all.

The issue as to whether, and what, legislation is necessary to bring about a closer working between the bodies representing the different methods of transport is a much-debated one, but Col. Moore-Brabazon's remarks emphasise the fact that the co-ordination of the transport facilities provided by tramways, omnibuses, and railways in London and other large towns is essential.

Lord Ashfield, at the same function, also referred to the necessity of co-operation. Most tramwaymen would prefer to solve their present difficulties by means other than Government subsidies, and Lord Ashfield's sentiment: "The strong must help the weak," seems to point in the direction of the desired solution. It is to the advantage of the community at large that waste should be avoided, and, as Lord Ashfield pointed out, closer co-operation would result in a large saving in the cost of transport.

Electricity in the Foundry.

CONSIDERABLE progress has been made in the last two or three years in regard to the installation of electrical equipment in foundries, both ferrous and non-ferrous. Electric cranes and runways are now quite common, and it is fairly certain that the present coal dispute will make many non-ferrous foundries substitute electric for coke furnaces. Comment is heard sometimes to the effect that the development of the electric furnace for melting metals has suffered because the furnaces were designed by electrical engineers who did not share the metallurgist's or the foundryman's point of view. The electrical engineer is obtaining this more and more every day, because electricity is now such a necessity in nearly every branch of foundry work that engineers trained in the industry are growing up with it. It has been said that it is as difficult to find a foundry in this country with electrical equipment as it is to find one without in America and Germany, but this statement was more correct a few years ago than it is to-day. Much attention has recently been given to electrical plant for sand treatment. During the past few years considerable improvements have been effected in the design of magnetic-separator pulleys for removing magnetic material from various substances, and one of the chief directions in which the use of these pulleys has expanded is for removing iron and steel particles from brass and other non-ferrous metals, and also for removing metal from the sand to prevent damage to mixing machines. It is very reasonably claimed for electro-magnetic separators that they reduce metal losses and retrieve brads, reduce handling and moulding sand costs, conserve space required for refuse and prevent defective castings. It has now become profitable to install separators in quite small foundries. The process is exceedingly simple, and the sole reason why such machines are not used in a greater percentage of cases is, we feel sure, because their advantages have not been sufficiently impressed on foundry owners.

London Electric Railway Extensions.

New Additions to the City and South London Railway and the Hampstead Tube.

On Monday last the concluding instalments of a comprehensive scheme of improvements carried out on the City and South London Railway and the Hampstead Tube were officially opened. The final sections are an extension of the first-mentioned railway from Clapham Common to North Morden, *via* Balham, Tooting and Merton, and a loop line from the Hampstead Tube at Charing Cross to the Kennington station of the City and South London Railway, *via* Waterloo. In addition to these extensions, the main scheme comprised the reconstruction of the first-named line and its physical connection with the Hampstead Tube at Camden Town, in accordance with modern underground standards, and the extension of the Golders Green branch of the latter railway to Edgware, *via* Hendon. The cost of the whole scheme has amounted to nearly £9,900,000, of which sum the Morden extension and the Kennington loop account for £4,750,000. The new line to Morden is about 5½ miles in length; from Clapham Common to Dorset Road at Merton, a distance of some five miles, the tunnels are of the standard tube design; the usual switchback principle has been adopted. The running tunnels were laid out in eight sections, averaging 3,000 ft. Between Tooting Broadway and Colliers' Wood the tunnels were constructed in two shorter sections in order to facilitate work at the former point, the use of compressed air being necessary owing to the ground being water-logged.

Fig. 1.—Morden Signal Cabin.

At Tooting Broadway, Balham, and Trinity Road, where extensive diversions of gas and water mains were necessary, operations were of a protracted nature.

Tunnelling proceeded from service shafts sunk, in the majority of cases, at the station sites, 18 shafts being sunk in all. Two types of excavating shields were used, the Greathead, inside of which the men work, and the rotary excavator, used for tunnelling through clay when expeditious work was necessary. The escalator shafts and passages at the tube stations were bored by hand.

At Merton the tunnels are unique for London tube-railway work, being built of reinforced concrete. The adoption of this construction was due to a water-bearing stratum being discovered a few feet below the surface. The tunnels were made in sections, in trenches dug between rows of steel piles driven into the ground from above. The reinforcement work was built first, collapsible moulds then being put in position and liquid concrete poured in. These concrete tunnels are 550 yards long and they have a rise of about 12 ft. At each end of the tunnels sumps have been formed to collect such water as may run down from the inclined cutting. Each sump has a pumping-house above it for transferring water into a drain connected with the main sewer in the Epsom road.

The Kennington loop is about two miles long, and is of the standard shield-driven iron-lined tunnel type throughout. Construction was carried out from shafts sunk at four points on the line of route.

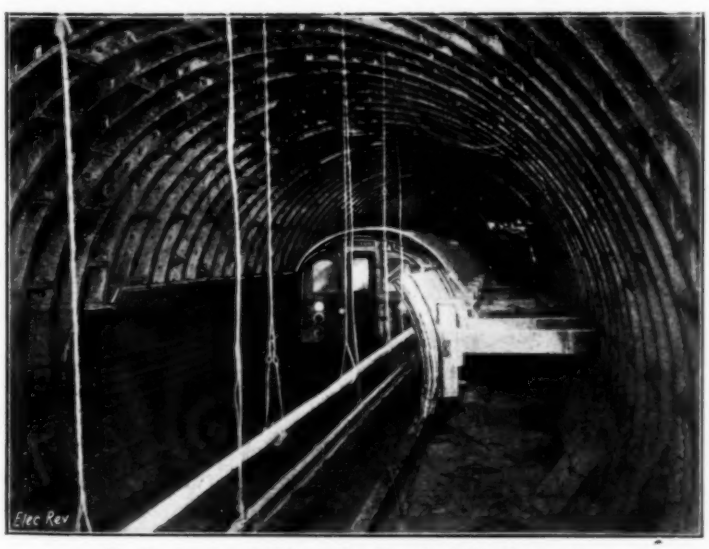


Fig. 2.—Junction of Old and New Tunnels, during Construction.

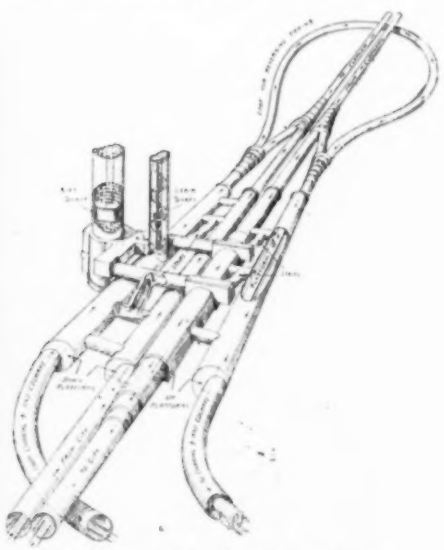


Fig. 3.—Diagram of the Kennington Tunnels.

Considerable engineering difficulties were entailed in the construction of the new lines. At Charing Cross, in making the connections between the new tunnels and the old terminal loop, some delicate sub-river tube surgery was involved. The "up" tunnel of the extension joins the old loop at an angle under the bed of the river, whilst

the "down" tunnel takes off from the neck of the loop. At the points where operations were proceeding the loop

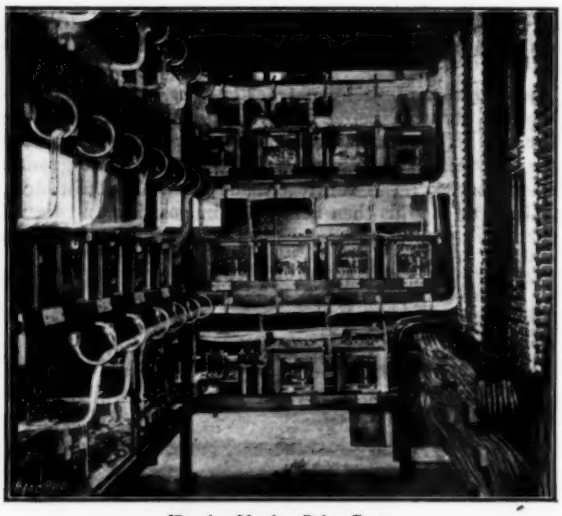


Fig. 4.—Morden Relay Room.

tunnel was sealed with concrete filling, to prevent the compressed air escaping from the works, whilst at the precise places at which it was to be cut through by the new tunnels it was filled with rough brickwork, as a precaution against a weakening of the old tunnel whilst the new ones were being driven through it. As a precaution against a disturbance of work through a failure of electrical power, three independent supplies of electricity were made available during the course of construction.

When work was proceeding on the tunnels between Charing Cross and Waterloo under the river, a factor that had to be considered was the fluctuating weight on the clay above, which varied as the tide rose and fell. This necessitated adjustments of the compressed air from 10 lb. to 20 lb. per sq. in., and *vice versa*. Towards the northern bank of the river, the cover of clay being less there, only half-ring lengths of tunnelling were excavated at a time, instead of the usual full-ring lengths. The installation of escalators at the new Waterloo station involved extensive underpinning of

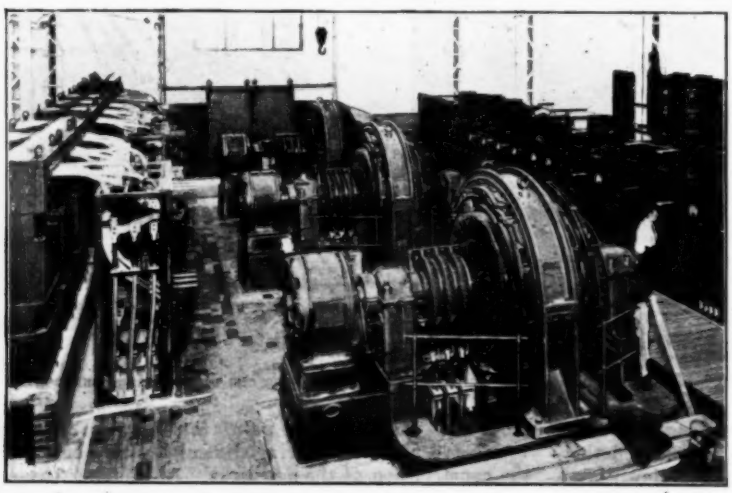


Fig. 6.—Balham Sub-station.

the piers of the arched viaduct carrying the main-line station of the Southern Railway.

In order that certain trains of the City and South London Railway may be reversed at Kennington for the return north, without deranging other services on this line, a siding has been constructed to the south of the station.

The work on this siding was a delicate and very interesting example of tube engineering. At Kennington there is a difference of 10 ft. in the respective levels of the running tunnels of the C. & S.L.R.; the ground in which they are situated consists in part of water-bearing strata, and the siding and its connections with the running tunnels had to be formed without interference to the rapid operation of trains through the latter. The siding tunnel was bored mostly by hand, and to hold back the water in the bad ground, air locks had to be formed and compressed air resorted to.

To connect the leading-in tunnel with the "down" running tunnel, a junction tunnel of step-plate type was formed around a section of the latter, figs. 2 & 3, which, of course, had to be completely exposed. Meanwhile, the running tunnel, through which trains were passing every two or three minutes, was supported at the base and sides by heavy timber struts, placed in position with meticulous care as the earth was removed from around the tunnel. To prevent the compressed air escaping from the air lock into the tunnel, the holes in the segments of the latter, through which the grout had been injected when the tunnel was constructed, were plugged.

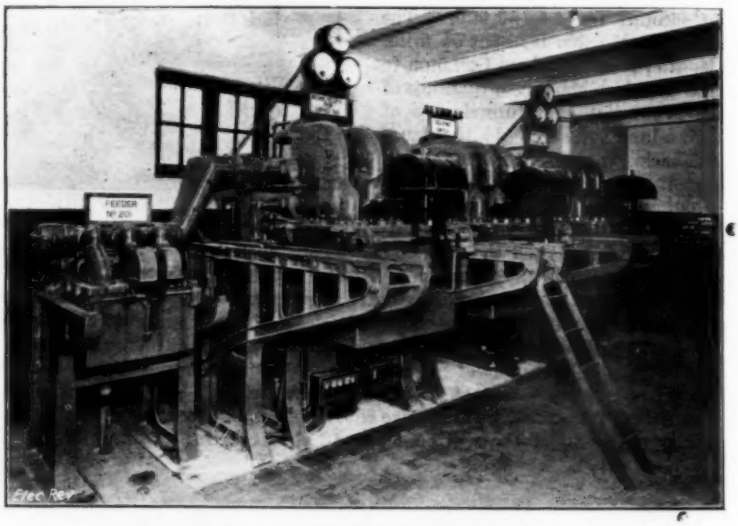


Fig. 5.—E.h.p. Switchgear at Colliers Wood.

At Tooting Broadway, the worst section of ground in the course of the Morden extension was encountered. The strata below the blue clay consisted of a layer of shell and shaly clay, which was hardened into a sort of natural concrete, whilst the strata of sand were water-logged. An idea of the quantity of water here may be gathered from the fact that, formerly, artesian wells in the district were supplied from this source.

Operations were conducted from three service shafts sunk above the site of the "down" running tunnel, to the south of the station. These shafts were excavated as far down as practicable without resort to compressed air, and then vertical air locks were fixed in the top of two of the shafts, and the sinking of the latter to the requisite depth of 50 ft. was completed. Meanwhile, the third shaft was sealed at the mouth with a steel diaphragm.

The track equipment on the extensions is of the latest London Electric Railway standard, the conductor rails being of special high-conductivity steel, carried on porcelain insulators.

The signalling arrangements on the new lines provide electric-lamp signals, in conjunction with which

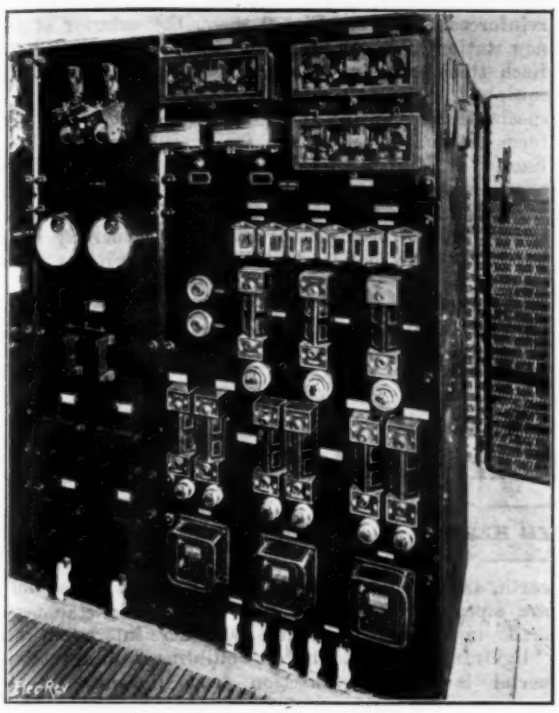


Fig. 7.—Control Panel at Wimbledon.

work electro-pneumatic train stops, condenser-type track circuits, and electro-pneumatic point gear. On the Morden extension there are two cabins, one at Tooting Broadway and one at Morden. All signals between Clapham and Morden work automatically, except those controlled from the Tooting Broadway cabin when the latter is working. With the exception of the points at the entrance to the depôt, the whole of the signalling at Morden is worked from the cabin. Figs. 1 and 4 show respectively the interior of the Morden cabin and the relay room.

Both the Tooting Broadway and the Morden cabins are provided with the latest type of power frames and safety devices, including an electrical lock on the point gear which prevents the points being wrongfully operated. Provision is made on the frames for additional signals. Each cabin has the usual illuminated diagram, which indicates the position of trains in the vicinity. Train describers notify the signalman of

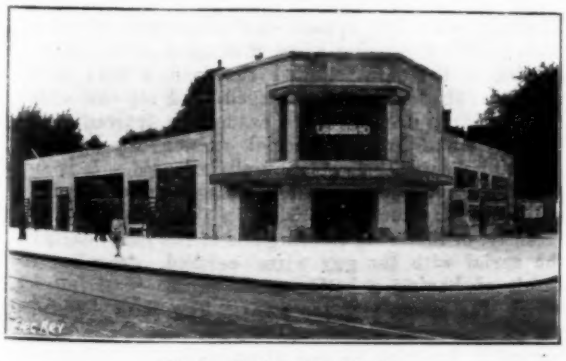


Fig. 9.—Clapham South Station.

the destinations of approaching trains. At Morden station an improved platform indicator is provided, to inform passengers of the respective destinations of the next three trains and of the platforms from which they will depart.

At the Kennington station a new 31-lever power frame which has been installed is arranged for automatic or hand working.

The electricity supply, 3-phase, 11,000 V, 50 periods, for the Morden extension is being obtained from the County of London Electric Supply Co., Ltd. It is received at a switch-house at Colliers Wood by Reyrolle h.p. switchgear, fig. 5, and thence transmitted to a sub-station at South Wimbledon, and also through the latter to another new sub-station at Balham. At these sub-stations the energy is converted to d.c. at 600 V. Each of the sub-stations houses Metropolitan-Vickers equipment. The South Wimbledon "sub" is of the ordinary manual type, and is equipped with three 1,200-kW rotary converters and air-cooled transformers, in addition to the necessary e.h.p. and l.p. switchgear. The Balham sub-station, fig. 6, is of the remote-control type, after the style of the one in operation at Burnt Oak on the Edgware extension. This installation comprises three 1,500-kW rotary converters, with air-cooled transformers, and the required automatic and ventilating equipment, in addition to air-compressing, lighting, and signalling plant. Balham sub-station is controlled from South Wimbledon, whence the machines can be operated individually or together, from either or both of the two high-pressure feeders, by means of switches in the latter station. Once a machine at Balham is running, it is protected by relays against every conceivable contingency. Fig. 7 shows the automatic control panel at Wimbledon. Both sub-stations are equipped with mechanical overhead travelling cranes, and accommodation is provided for additional plant.

Fig. 8.—Morden Depot.

The supply for the Kennington loop is obtained from the power house at Chelsea, through a new sub-station built beside the Lambeth North station of the Bakerloo Tube, in the Westminster Bridge Road.

This sub-station is also of remote-control type, and is operated from the sub-station at Charing Cross. The equipment here, of British Thomson-Houston design and manufacture, comprises two 1,500-kW rotary converters and air-cooled transformers, with the usual switchgear and auxiliaries.

On the Kennington loop and in the tunnel section of the Morden extension the cables are carried on cast-iron brackets, bolted to the tunnel segments; in the Morden station cutting they are suspended along the retaining walls, whilst on the ground section they are supported on concrete posts.

The terminal depôt at Morden, fig. 8, occupies a spacious site on the east of the Epsom Road. The car-sheds are constructed on a steel-frame structure of five bays, and are 426 ft. long by 300 ft. wide, with walls of stock brick and end gables faced with corrugated asbestos sheet. The steel-truss roof is covered with

asbestos tiles, and roller shutters are fitted to all car entrances. The depôt is peculiar in having a public right-of-way extending directly across it. The site was originally crossed by a footpath, and the company has had to replace the depôt section of the path by a footbridge. This is constructed of reinforced concrete, is 660 ft. long, and has eight spans. Accommodation is provided for 250 cars, and there is room for extensions. The car-sheds contain 20 inspection-pit roads, each of which is 385 ft. long and has a capacity for seven cars. Concrete ledges run along each side of the bottom of the pits, so that men working under the trucks have two levels on which to stand. Overhead trolley bar conductors are provided, and carry roller-type connections for leading cables, with special adapter terminals for the cars which can thus be moved about over the pits electrically.

The design of the new stations has been evolved from one key elevation, which has been adapted to the peculiarities of the various sites and positions. In every case the material is Portland stone, with a canopy of reinforced concrete. Fig. 9 shows the exterior of the new station at South Clapham on the Kennington loop. Each station has a spacious booking-hall, which is equipped with passimeter booking-booths fitted with special ticket-printing and issuing machines, which perform the dual function on the pressure of a button. Except at Morden, escalators of the cleat-comb type afford easy and direct communication between the booking-hall and platforms. At Charing Cross an extensive scheme of improvement to the station generally is in hand, apart from the additions and alterations necessary at the Hampstead Tube section. The chief function of the combined station of the Hampstead Tube and the City and South London Railway at Kennington will be of an interchange traffic and terminal nature.

The Lightning-Rod Act in Ontario, Canada.

By KILLINGWORTH HEDGES.

THIS Act became operative in January, 1922, and the regulations are very specific with regard to the protection of the lives and property of the people of Ontario from the dangers of lightning. No person or corporation is permitted to sell material intended to be used for the protection of buildings, or to install any apparatus, until authorised to do so by a licence from the provincial fire marshal; penalties and fines and imprisonment are enforced for the violation of the Lightning-Rod Act. The installations made by the various companies are continually tested and inspected, and the contractors must furnish the Fire Marshal's office with certificates giving details of the work performed, showing that the earth terminals have been carried to the full depth required by the regulations.

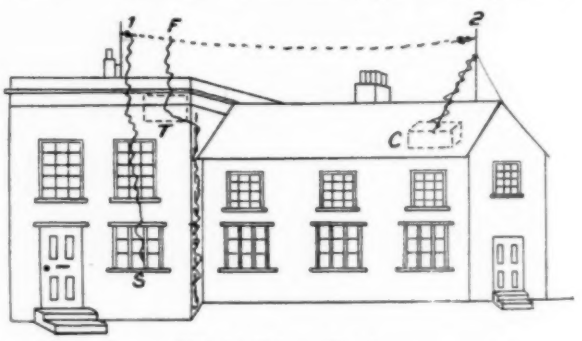
A report recently issued for 1925 shows that the average increase in efficiency and manner of installation of lightning-rod apparatus in 1925 over that erected in 1922 is 173 per cent.; the number of installations made in 1925 was 6,817, and of those inspected, 41.9 per cent. were found fully to comply with the regulations of the Lightning Act. The greater protection afforded by properly-installed systems is accentuated by the fact that in 1917 approximately 51 per cent. of the losses sustained by the Farmers' Mutual Fire Insurance Companies in Ontario were caused by lightning; in 1923 the loss was reduced to 20 per cent., and in 1925 to 18 per cent.; in the case of another company it was only 9 per cent. Further analysis shows that among risks carried by the Farmers' Mutual Companies there were eight losses on buildings with conductors, or 1½ per cent. of their losses for the year, but with unprotected buildings this increased to 16½ per cent. by 205 fires caused by lightning in 1925.

It is interesting to note that there are several instances of damage by the current passing along metal clothes lines. In one case the line was fixed to a tree which was struck; lightning damaged the house where the end of the line was attached. In another (illustrated in the report) the line was fixed to the outside of a frame house, inside which a woman was lying on a couch, with her husband sitting beside her; the stroke killed the woman and paralysed the man.

Radio and Lightning.

The report refers to radio masts and antennas on the roofs of buildings, and states that they are likely to nullify the protection provided by the lightning conductors, especially if the aerial is higher than their terminal points. Attention is drawn to the danger of attaching an aerial between a tree and a house unless a switch of ample capacity is fixed outside the building on the receiving set, with a break of at least 4 inches, together with a notice to connect the line directly to earth, and not to use the set during a storm. The public are especially warned against the foolish statements made in radio papers, and by others interested, that "lightning arresters protect buildings, and that an aerial is a good protection from lightning"; the arrester, as a matter of fact, simply provides a shunt round the receiving set, and is of use only if it is connected by a heavy conductor to an efficient earth.

A photograph is given in the report of a farmhouse near Brampton, Ontario, damaged by lightning in May, 1925. The accompanying illustration shows the direction of the stroke, which followed three paths to the ground. The mast 2, supporting the aerial at one end of the roof, was struck. The current ran down the guy wire to a cistern C and a down feed pipe to earth, but the flash also passed by the aerial to a point F directly above the overflow pipe of the water tanks T, under the roof. It descended by the feed pipes to the ground,



Lightning Paths on Farmhouse.

setting fire to shavings around the pipes and tanks. The flames rapidly spread and completely gutted the main building, causing a loss of about $7,000. A small portion of the flash followed the lead-in wire to the arrester (which was not damaged) and set (completely destroyed) to earth. The example is interesting, as the method of fixing an aerial between a pole on the roof and a chimney is very usually adopted. It is suggested that poles on buildings and guy wires should be earthed; an account published in *The Times* (London) recently, of lightning striking one of two masts carrying the aerial with the guy wires earthed, describes the result of having a better earth on the receiving set, which was about a metre away. The flash descended the guy wire and jumped to the earth wire of the set and melted it, ignoring its own direct path.

I am indebted to Mr. George F. Lewes, deputy fire marshal of Ontario, Toronto, for the report from which I have made this extract.

Electrical Progress in Italy.

[From Our Special Correspondent in Italy.]

lr, with a Treasury deficit over a period of years, the Italian Government has been enabled to initiate and find capital, in great part, for electrical enterprises representing an investment of nearly 6,180 million lire, what may be expected in this direction during this, the next, and several years to come, by reason of the handsome surplus of nearly 607 million lire which is said by the Finance Minister to lie already at the disposition of the Government? Much of this large sum may have been pledged in the form of subsidies or advances made to certain establishments; but ample funds remain, as it would seem, to finance Italy's greatest and most remunerative industry.

It would be an error to suppose, however, that the altogether astounding expansion that has taken place in hydraulic enterprise in Italy has been attributable to the energies, efforts, or encouragement of any one individual or group of individuals. While the support and inducement provided by the present régime cannot, and should not, be underestimated, it is but fair to remember that there were "Heroes before Agamemnon." Signor Giovanni Giolitti's ground-work in 1920, for example, formed but the prelude to the energetic policy initiated by Signor Nitti, who, whatever his failings may have been as a Minister (and he held the Premiership for three terms), certainly deserves the recognition of his countrymen for the practical aid which he lent to their efforts towards a wider industrial expansion. The more general adaptation of the river and waterfall systems to the use of electricity under Government aid formed part of these great services. While Signor Nitti was still in office, hydro-electric power had been developed to the extent of 1,040,000 h.p., and his Government had granted a large number of concessions covering an estimated output of nearly 2,000,000 h.p. Then, at the time that Signor Giolitti (after having ruled supreme, save for a few brief interludes, for ten years) again took office for a few months, in 1921, the total h.p. developed had increased to 1,270,000, with a total h.p. of concessions granted, 2,111,000. It was, for instance, during, and towards the close of, the Giolitti régime that it was decided by the Government to electrify the Turin-Genoa-Pisa-Florence; the Pisa-Florence-Faenza; the Turin-Milan-Trieste; the Turin-Modane; the Rome-Nettuno; the Benevento-Foggia; and the Rome-Gaeta-Naples lines. Signor Bonomi was also generous in his encouragement of enterprises of this character. In 1922, when Signor Mussolini first assumed office, the total h.p. developed in the country had amounted to 1,450,000, and the total h.p. of concessions granted came to something over 3,170,000. By the end of 1925 the h.p. developed had increased to 1,840,000, while concessions, new and old, granted totalled 3,775,000. The first year of the Mussolini Government saw fresh investments in hydro-electric companies being offered almost daily, this form of utilising savings becoming more and more popular and regarded, from past experience, as both safe and conservative. At that period there were in existence about 355 plants, with a capacity of 1,564,216 h.p., and representing an invested capital of about 16,465 million lire.

A tour recently completed through the chief industrial centres of the Kingdom and the Islands (Sicily and Sardinia)—all now enjoying an era of political peace and material prosperity known at no previous period of the country's history—leads to the conviction that Italy within the past three years has really effected enormous electrical development. Extraordinary, anyhow, has been the growth of electrical enterprise since the early days of the A.E.I.E., that is, in or about 1898, when Italy was supplying little more than 180 million units of electrical energy all told, whereas to-day the distribution has been increased to no less than 7,600 million units annually.

In 1914, but 507 million lire of capital was invested in Italy in hydro-electric development; by the end of 1925 this had amounted to 6,500 million lire. During the first half of 1926 the ratio of increase has been no less notable, and it may be safely assumed that before the close of the current year a further 2,000 million lire of additional capital will have been found—or promised—so that the end of 1926 should witness a total invested capital in electrical enterprises of more than 8,000 million lire.

Senator Conti, an accepted authority and the head of one of the most important electrical power companies, considers that new capital will be at an average rate of 1,000 million lire per annum; he estimates that, as the savings of the Italian people average 14,000 million lire per annum, one-fourteenth part of this capital might well become available for investment each year in electrical undertakings. Certain it is that up till now there has never been any difficulty in inducing native capitalists to support hydro-electric enterprises when offered for investment. It is, indeed, a remarkable fact that the splendid power system which has been built up in the Kingdom of Italy has been almost exclusively constructed by private enterprise and by means of private capital. The Government stands behind both with promises of support in the form of guarantees or subsidies where necessary. Up till now, foreign investments in electrical enterprises have been few and the amounts provided comparatively small. Within recent months the Credit Institution for Works of Public Utility has resorted to foreign borrowing for the purpose of extending its enterprises in the direction of some important hydro-electric concerns, and, through its banking associates, has issued 7 per cent. gold bonds, which have been sold upon the New York market.

When the Associazione Esercenti Impresse Elettriche (commonly referred to as the A.E.I.E.) was founded in 1898, the only power stations then in existence were those at Milan—still ranking as the largest in Italy—belonging to the Società Generale Italiana de Elettrica Systema Edison, and those at Tivoli and Vizzola Ticino, started by Signor Gallileo Ferraris.

One group of supply stations alone—namely, that belonging to the Società Idroelettrica Piemonte (commonly referred to as S.I.P.)—is already supplying 500 million units. According to a statement attributed to Signor Ing. Ponti, the head of the concern, the output before the end of 1928 should have risen to about 1,500 million units.

Power is being generated by more than 2,000 different electric stations, of which 400 only, however, can be considered to rank in importance. Their power is generated almost entirely from water, while the thermal electric power stations, having a joint capacity exceeding 580,000 h.p., are utilised only for a few hundred hours annually, that is to say, during the period when there is a scarcity of water. In 1925, of a total of 7,600 million kWh distributed, fewer than 300 million kWh were produced thermally. To provide this energy from coal, an expenditure of 2,000 million lire, upon about 10 million tons of coal, would have been necessary.

Italy's present system of hydro-electric supply has not been decided upon without long and careful thought, and the fullest consideration has been given to future demands. Nor has the task of selection proved as simple as the country's splendid river, lake and waterfall system would suggest to the casual visitor passing through the country. Those who were responsible for the designs of the stations and the distribution of the energy produced had to take into consideration many important factors. It was necessary, for instance, to choose for early exploitation the main centres of population and those of chief economic and industrial

activity. Except in some few instances, these centres lay in the dry zones and at considerable distances from the power zones. It therefore became necessary to construct a network of main transmission lines over the greater part of the country, enabling the Italian industrialist, as well as the agricultural worker, to obtain the best results with the least expenditure of capital or manual energy.

Among the first efforts in this direction—brought about mainly by the scarcity and costliness of coal—were those made by the Fiat Works at Turin in May, 1923, when, in place of the Martin furnace then employed, there were installed four large electric steel furnaces of 15-20 tons each, and two smaller ones of 3-6 tons individual capacity. Later on, a fifth installation of 4-8 furnaces of the same type was added. Electric furnaces built in Sardinia are used to convert ores. Here are to be found power stations, fitted with two groups of turbines of 6,000 h.p. and 9,000 h.p each to provide irrigation.

Beyond its employment for lighting and driving machinery, both industrial and agricultural, electricity is being developed in this country in many different useful directions, such, for instance (besides the operation of electric furnaces, which now consume over 300 million kWh), as the production of nitrate for fertilisers, and traction on the State railways (which have already electrified about 900 km. of their lines, while contracts for some important extensions have been either entered into or are in contemplation). Its employment for domestic work in many hundreds of thousands of households is also being extended.

Among the main centres lying in the dry zones, but at considerable distance from the power zones, are Rome, Genoa, Turin, Milan, Naples, Leghorn, Venice, Ancona, Spezia, Ravenna, Padua, Mantua, and Ferrara, all of which cities lay outside the power zones.

Through the force of natural conditions, Italy has already become, and in a few years will become still more, a self-contained power zone linked up for the transmission and distribution of electric power from the Alps to Sicily.

The Alps and Apennine mountain ranges form—as is known—the main water-power resources of the country. Of the 21,000 million kWh per annum capable of production from water-power, it is estimated that 12,000 million will be obtainable from the Alps and the remainder from the Apennines. Senator Conti has given it as his opinion that an additional 7,000 million kWh per annum will be developed within the next ten years, and that in twenty years from now Italy's hydraulic resources will have become almost fully developed.

In the north, water power is most abundant during the spring and summer months, when the Alpine snows melt; in the south and centre, winter rains swell the torrents of the Apennines, thus providing an abundance —at times even a superabundance—of water available for power. By developing the system of long-distance high-pressure transmission, it has been found possible to compensate, to a considerable degree, supply and paucity which are due to climatic conditions. There are at present more than 50,000 km. of high-pressure lines in Italy, in addition to many thousands of kilometres employed for local distribution. Over 1,600 km. of electric cable lines, at a pressure of over 100,000 volts, are in use. Italy claims to be one of the very few countries of the world which can show so remarkable an advance in this class of hydro-electric development.

Ignorant and stubborn as is sometimes found the Italian landowner, usually a peasant entirely illiterate, but not without a native reasoning power—especially in Tuscany and Piedmont—he is not indifferent to the benefits attaching to a reliable water supply for his crops. Already there has been formed an association known as the Anglo-Roman Society, which is utilising for its well-cultivated areas water supplied by power from the Tivoli district. Perhaps the greatest progress, however, has been among the cultivators of Sardinia, to whom the recently-completed power station on the Tirso, as well as that of Cochinas, is bringing the precious benefits of regular irrigation for their sometimes parched crop lands.

In Sicily, again, since 1920, hydro-electricity has brought valuable results to the agricultural districts where rains are very infrequent. The waters of the River Alcantara have been impounded in dams, and are distributed through canals and ditches. This has been rendered possible largely by the enterprise of the General Electric Company, of Sicily, formerly known as the Società Elettrica della Sicilia Orientale. In 1924 there was also formed the American Power Company (with a capital of $2,000,000, the bonds of which were issued in the United States at 99 per cent.), with the idea of assisting agricultural enterprises. The needs of the Apulia district are being satisfied by the provision of water in ample quantities, raised from beneath the soil by electric pumps. Electric ploughs and other machinery can now be used for the cultivation of the land. In this region, likewise, artificial lakes, which have been almost completed, on the Sila plateau, will supply the energy for the many central stations already, or soon to be, erected. It is worthy of mention in this respect that the Government has found, or is pledged to find, nearly 5,000,000 lire for irrigation works of various kinds in different parts of the kingdom.

The Control of Low-Pressure Distribution.

Suggestions for the Equipment of First-class Power Installations in Factories.

By J. O. KNOWLES, M.A.

ONLY about a quarter of this country's factories are electrically driven, and there is therefore a big field for installation work, as electricity supply continues to extend. One detail of this installation work is well in the foreground of official regulations at the present time —the choice of the switches and fuses which isolate and protect the factory supply from the increasingly large reserves of power in the supply lines.

Considering first the design of fuses, it is clear that, for all but small sizes, the short-clearing capacity of the fuse is increasingly more important than the ability of the fuse to run continuously close to its fusing current. When fuses were used more frequently for the protection of motors from overload, it was an intrinsic fault of fuse protection that the motor might run under small overloads (up to 100 per cent.) for dangerously long periods without the fuse blowing. On the other hand, if the fuses are run at currents close to the fusing current, the fuse wire gradually deteriorates through oxidisation, and has to be renewed at irregular but frequent intervals. In general, the use of fuses for the protection of all but small motors has been practically dropped and need hardly be considered.

In proportion, however, as the importance of close overload protection by fuses has waned, the importance of short-circuit protection by fuses has increased. Thus a 100-ampere fuse may not need to blow under 200 amperes, because the motor circuits fed from it will have their own overload protection, but as the fuse is a second line of defence, it must clear any surge current that the line can supply if a dead short occurs. As a *minimum*, the I.E.E. Regulations suggest that a 100-ampere fuse should clear a momentary 1,500-kW supply (6,500 amperes at 250 volts), and on present-day supply

lines this is by no means an unreasonable minimum. Close to a 50,000-kW power station the power that can be fed into a short on even a small feeder may easily be greater than 3 per cent. of the station's output. If the fuse does not clear such a fault, it will in a few seconds be reduced to a shattered and twisted mass of fused porcelain coloured here and there with molten copper. In laying out a new factory installation, consulting and other responsible engineers must be sure that their defences against the bulk power supply are adequate on every circuit. At the present time, not enough is known about the capacity of fuses to clear short circuits because of the difficulty of securing a measurable heavy short circuit of over 10,000 amperes from a battery. No official standards have, therefore, been set for the short-circuit rating of "ordinary duty" fuses of over 100 amperes normal capacity or for fuses of heavy rating in any size. To some extent the place of fuses of large capacity has been taken by circuit breakers whose kVA breaking capacity is more or less guaranteed, and no doubt this tendency will increase. But at whatever capacity the dividing line between fuse protection and circuit-breaker protection is fixed, it is important that there should be as little doubt as possible as to the breaking capacity of the fuses selected.

The present consensus of opinion is that for all but small fuses, the fuse wire may be enclosed in an asbestos tube so supported in the porcelain handle that the fuse wires, after leaving the ends of the asbestos tube, are bent, so that the arc cannot reach the contacts or fixing screws. The bend, however, must be carefully made so that the explosive effect of the short-circuit current at the bend is allowed for and given free vent. The vents should be liberal, but it must be remembered that the more the gases can be cooled before reaching the case, the better, and the vent should be so arranged that the gases expand in the vent and pass over a large surface of cool porcelain. If the gases are baffled too much, the fuse will break down between contacts before arcing to the case, so that a reasonable compromise must be made.

With regard to contact clips, the official regulations call for reasonable temperature rises on the contacts, but tests made on a new fuse will differ very considerably from tests made on the same fuse after it has been subjected to one or two heavy short circuits. Thus a fuse whose contacts when new ran at 25 deg. C. rise was found on testing again after two heavy short circuits to have a temperature rise of over 100 deg. C., owing to the weakening of the contact pressure by the short-circuit current and to a slight burning of the contacts. It is of course only reasonable to replace a fuse entirely after it becomes lined with metal deposited from the fusing gases during several heavy shorts, but unsatisfactory operation will be found to occur through overheating and oxidisation if the contacts are not made strong enough to resist the heating and distorting effects of heavy momentary currents.

Switch contacts are also subject to heating from the above causes, which are, however, overshadowed by the loss of good contact due to pitting and burning during action. The standard maximum temperature rise of 20 deg. C. below 100 amperes rating, and 30 deg. C. above, is therefore very reasonable for a new switch, and much better results ought to be got if prolonged life of the switch contacts is to be obtained in actual practice. Switch contacts for hand-operated quick-make-and-break switches are now usually of the clip and blade type, this form being deservedly popular because the clip holds the blade while the operating spring is extending, and it has also a cushioning action during the quick make, thus eliminating "bounce." The brush type of switch is not suitable for main switches unless provided with auxiliary breaks, and in small sizes the brushes are difficult to manufacture, and liable to be distorted in use if not actually burnt.

A quick make as well as a quick break assists in keeping the contacts clean and cool, provided that the operating mechanism depends on springs having less than, say, 20 per cent. extension, and that a positive follow-up action is given so that the switch will open even if the spring breaks or loses its elasticity. Switches are liable to be installed in places where maintenance is difficult, and steel springs have a short life in certain atmospheres. A switch should be considered as of first importance in an emergency, and its certain action should therefore not be imperilled by absolute reliance on a spring.

The breaking capacity of switches cannot usually be considered to be equivalent to the breaking capacity of fuses, since the switch is normally operated under not more than full load, and even if a short circuit has occurred, and has to be cleared by opening the main switch, the current has usually fallen considerably after striking the short-circuit arc. The standard regulation that switches should break 50 per cent. excess current at 50 per cent. excess voltage is therefore a minimum which makes allowance for a falling-off in the capacity of the switch after prolonged use rather than for a margin in breaking under heavy loads.

The enclosure of the switch contacts so as to protect against accidental shock can be made to give increased breaking capacity by careful design. In any case the provision of shields over the contacts as standard practice is in line with the general and continuous improvement of electrical switchgear so as to make it safe for the non-electrical user. When they are fitted as a standard, the extra cost is trifling, and more than balanced by the extra service given.

In line with the same process of development from open-type switchgear to enclosed ironclad gear, the subdivision of the incoming supply into several feeder circuits is now best made in the average factory by an ironclad distribution board, having a number of switch and fuse units, one for each outgoing feeder, connected by busbars supplied from an incoming unit which may be either a switch with fuses or a circuit breaker with no-volt and overload protection, according not only to the size of the installation, but to the capacity of the supply cable to give a heavy short-circuit current.

On this distribution board may also be mounted not only a main ammeter and voltmeter, but also other instruments, according to the size of the installation. Thus if ammeters are fitted on the outgoing feeder units, these ammeters may have maximum-demand pointers, so as to trace the cause of increases in the maximum demand (especially where power is bought on this basis). An outgoing watt-hour meter, if fitted, will act as a check against the supply company's meter, though a power-factor meter may prove a better investment.

From this main distribution board, feeders can be taken to sub-distribution boards in various sections. Some doubt may be felt as to whether, in the case of large feeders, a supply should be divided by means of a fuseboard having ways of large capacity, or whether a number of switch-fuse units connected by a busbar chamber should be used. The use of switches with fuses prevents the withdrawal of a fuse from a circuit which is supplying power, and a decision must therefore be made on the basis of whether there is any likelihood of a responsible person making this mistake in the particular circumstances. (It is assumed that the fuseboards would be padlocked, so that only responsible persons would have access to them.) In any case, if a fuseboard only is used at a distance from the main distribution board, a switch should be in circuit at a near point that will isolate the fuseboard as a whole.

To summarise, it is suggested that for power circuits, the protection of the motor against overload should be secured by overload protection on the motor starting panels, that the fuse protection in the distributing switchgear be considered as a second line of defence to be made capable of withstanding the severest short circuit possible under the conditions of supply, and that the distribution of power should be worked out as a complete scheme with due regard to safety and reliable operation, following the latest official recommendations and rules. It is hardly necessary to add that the writer has in mind first-class installations of reasonable size, where it is neither possible nor desirable to give, after the erection of the job, that special attention and "maintenance" which is given in a "one-man" shop.

The First National Radio Exhibition.—II.

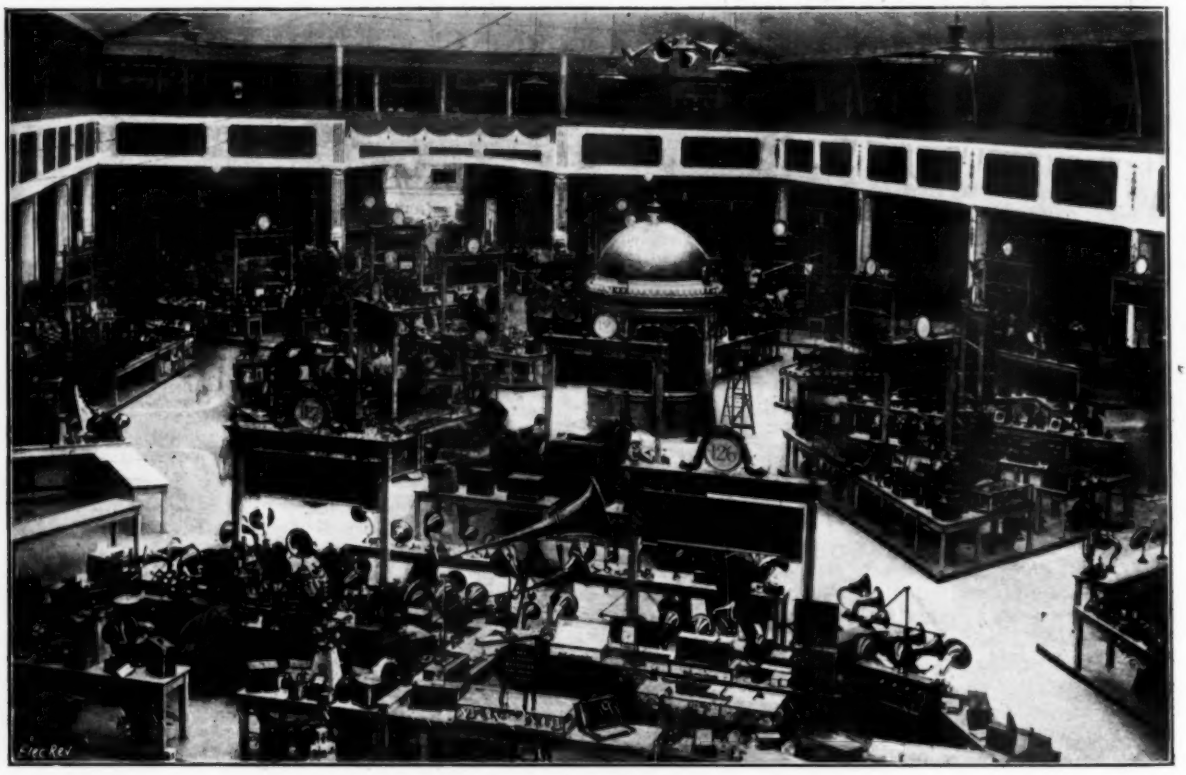
A Review of the Exhibits.

By PAUL D. TYERS.

IN last week's issue of the REVIEW some general impressions of this year's Wireless Exhibition were briefly outlined, several of the sets exhibited being dealt with in greater detail. Complete sets and accessories appeal to their own particular public, and the general development in set design having been mentioned, it is not proposed to deal with this subject any further, but to confine these notes more particularly to progress in the design of accessories and components.

The same general line of development which was reflected in the complete sets is again to be found in the accessories. Briefly summarised, it is simply increased efficiency and more scientific design, the two, of course, being very closely related. Since last year's Show certain components have undergone far more rapid changes than others, loud speakers being an example of such a change. It is extraordinary to notice the tremendous progress which has been made in loud-speaker design, the old familiar horned type being now very much in the background. The introduction of the Amplion "Radiolux" was perhaps the first sign of the waning of the general popularity of the horned speaker. Since that time, however, experiments have been made with the large-diaphragm type of speaker, that is, one in which no horn or sound conduit is used to concentrate the sound. Mention must be made of the "Celestion" loud-speaker, which is a centrally-supported single-cone type enclosed in a cabinet, and was, of course, well known before the last Exhibition. Perhaps one of the best types of diaphragm speakers is the "Kone," which is a Standard Telephones and Cables production, and is to be found in the Exhibition on the stand of the B.S.A., whose exhibits, of course, are made by that Company, and also on the Burndept stand as the "Ethocone." The B.S.A. is also showing a smaller cone type, which is housed in a metal case. The G.E.C. is showing a cone type of speaker, and Messrs. Brandes are showing two types of cone speaker in wooden cases. Another diaphragm type, although of considerably smaller dimensions, is the "Beco" speaker, the diaphragm in this case being of metal. The B.T.-H. Co. is also showing a cone speaker built into a cabinet in conjunction with a speech amplifier, the speaker and the amplifier being mutually suited, so that excellent reproduction is obtainable.

Many years of research having been spent on battery design, and the battery not being confined to the wireless market, this has not changed to any appreciable extent, although many types have been especially designed for wireless purposes. Many of the well-known battery makers are represented at the Show. It is interesting to notice that the "Nife" alkali cell is to be found there; it has probably been little known to the radio public in the past. The Darimont battery, which is a special form of primary battery, and the Le Carbone air-depolarised Leclanché cell, are being shown in models suitable for operating dull-emitter filaments, and should make a particular appeal to those living in remote parts of the country, where charging facilities for accumulators are not available. The Tungstone accumulator is also making its first appeal to the wireless public, and is essentially an ordinary secondary cell, the peculiarity lying in the material used for the grids of the plates.



A General View of the Exhibition Hall at Olympia.

There is a very marked improvement in the design of variable condensers, both mechanically and electrically. At last year's Show, low-loss condensers were considered a novelty, but nowadays a condenser which is not built on the low-loss principle scarcely finds a market. The superiority of this year's condensers over those of last year is most marked; about three years ago the square-law condenser was introduced into the wireless market, and within a few months of that time square-law condensers practically predominated. This year, however,

corrected-square-law, and particularly straight-line-frequency condensers, hold the field. Perhaps one of the most popular straight-line-frequency types is that of the Ormond Engineering Co., which is provided with a very ingenious slow-motion reduction gear. Messrs. Beard & Fitch, Sidney Bird, and Bretwood are also showing very good straight-line-frequency condensers. The Ripault condenser is of rather novel construction, being provided with two sets of plates which overlap with a parallel motion.

Multiple condensers, that is, condensers consisting of a number of rotors operated by one shaft, have been used to a limited extent for some considerable time. The development of this principle is to be found in the Bowyer-Lowe gang-control condenser. This consists of a number of condensers of which the rotors are controlled by one knob, but provision is made for adjusting the position of any one rotor with respect to another, so that accurate balancing may be provided. There are also a number of condensers of special type, amongst which may be mentioned the Dubilier Univane, which, incidentally, was to be found at last year's Show. The rotor shaft really consists of a long pinion, and each vane of the rotor is mounted separately. Rotation of the pinion moves first one vane through 180 degrees, and then picks up the next vane, the process being repeated until all the vanes have been interleaved.

The introduction of low-loss coils and condensers has been necessitated by the demand for more selective tuning owing to the very great increase in the number of stations working over the broadcast band. Without selective circuits it is quite impossible to tune-in distant stations with any reasonable degree of selectivity. Such fine tuning has, therefore, necessitated the use of better controls for variable condensers, the single knob now being completely out of fashion. Those condensers fitted with a separate vernier plate are now in the minority, and modern practice demands the use of a rigidly-mounted low-loss condenser provided with a slow-motion dial or some form of reduction gearing. Some condensers, such as the Ormond and the G.E.C., have reduction gearings fitted to them, but many manufacturers obtain their slow motion by means of a special dial. The majority of slow-motion dials consist of a gear or friction-reduction arrangement, many of them on the epicyclic principle. Some very good dials are being shown by Messrs. Beard & Fitch, Burndept Wireless, Ltd., Detex Distributors, and Wilkins and Wright.

Tuning coils show a very marked improvement upon those of last year. The old familiar basket-type coil is still to be seen, but there appears to be a greater demand for a more efficient coil. Coils in which there is not adequate spacing of the turns are becoming less popular, and there are several very efficient coils to be found in the Show. The Gambrell and Edison-Bell are two examples of the spaced layer type of plug-in coil, and are far more efficient than some of the earlier types. The Gambrell coil, of course, has been marketed for several years. Probably two of the best coils in the whole Exhibition are Messrs. McMichael's "Dimic" and "Unimic." The "Dimic" is a solenoid type of coil, consisting of a spaced-turn single layer with an air core. The skeleton former is of moulded ebonite, provided with a special type of blade contacts and a suitable holder. The coil comprises two equivalent halves, and is particularly useful in neutrodyne circuits, where equivalent halves are required. The "Unimic" is similar to the "Dimic," but consists of one winding only, provided with two U-shaped contact blades, which fix into a spring type of holder of a rather ingenious design. A somewhat similar coil is the "Tunic"; this is again a double type of coil, but is provided with terminals, and is not so readily interchangeable. Another coil of this type is being shown by Messrs. Radiax, the coil this time being provided with small pins which co-operate with sockets on a suitable base; the coils, of course, are interchangeable.

Several excellent new valves have made their appearance since last year, amongst which may be mentioned the short-path type of valve, which was first marketed by Metro-Vick Supplies, and forms part of their "Cosmos" series of well-known wireless apparatus. Messrs. Alfred Graham & Co., of "Amplion" fame, are also marketing a valve, which, of course, is an entirely new departure for this firm. The Mullard P.M. series, provided with a very large filament area, appears to be very popular. Two new valves are the U4 and U5 of the Marconi-Osram Valve Co.; they are single-anode and double-anode rectifying valves respectively. These have been produced, of course, to meet the demand for a suitable rectifying valve for use in h.t. battery eliminators. While dealing with the subject of valves, that of the valve-holder naturally arises. Nowadays, amongst discerning experimenters there seems to be very little demand for the old type of valve-holder, and the anti-microphonic type seems to be almost universally employed. Most of the well-known accessory manufacturers are showing holders of this type, and Burndept Wireless, Ltd., was one of the first in the field last year. Valve-holders are of two distinct types: those mounted on springs and those mounted on sponge rubber. Perhaps the best holder in the Show is the Marconiphone rubber-mounted type, but the spring variety, such as the Benjamin, and the Lotus, made by Messrs. Garnett, Whitely and Co., are immensely popular.

Several accumulator chargers are to be seen, and it is interesting to note that the tantalum rectifier is becoming popular. The Balkite charger and the Balkite Trickle charger, manufactured by Burndept Wireless, Ltd., are examples of this type of charger. The tantalum rectifier makes an appeal since it is silent in operation, and requires no adjustment when running, in addition to being absolutely reliable. The trickle charger was practically unheard-of last year, but is now being extensively used. Rectalloy, Ltd., are showing a trickle charger, which is again, it is believed, of the tantalum type.

The modern tendency is to use resistance amplifiers in place of the old transformer-coupled amplifier, and this has led to the marketing of several resistance-coupling units, as well as anode resistances, of various values. The Varley Magnet Co. is showing some excellent wire-wound anode resistances, while the Radio Communication Co., and Metro-Vick Supplies, are showing coupling units, comprising anode resistances, coupling condensers, and grid leaks, assembled in a case provided with terminals.

There is an almost endless variety of minor accessories and appliances which it is somewhat hard to classify. Wander plugs, terminals, small fixed condensers, variable resistances, and rheostats are all to be found in profusion. One interesting exhibit is the Benjamin "Zig-Zag" earth, consisting of a specially-folded length of copper sheet, possessing an appreciable surface area. Wireless on the "Meccano" principle is to be found in the "Blackadda Way," which is a series of components fitted together on base boards and brackets, provided with holes to which they are attached. Anything from a crystal set to a multi-valve receiver can be built up in this way. The H.B.H. and Lissen remote-control units are two relay devices for switching-on a set from a distance, and are perhaps two of the first instruments of this type to be shown to the public. Finally, mention must be made of the Baird Televisor, which appears to give some of the best results which have yet been attained in wireless television. Television is not yet sufficiently advanced to enable one to make any definite statement or to draw any comparisons, as it is really still in its experimental stage. The Televisor, however, is certainly an interesting exhibit.

When reviewing the Show as a whole, one is very forcibly reminded of the fact that practically every exhibit is well designed both mechanically and electrically, and can certainly do more than hold its own with anything which is likely to reach this market from overseas, a condition which, it seems, the public as well as the engineer are fully appreciating. British broadcasting, from a technical point of view, is acknowledged to be the finest in the world, and it seems that the manufacturers of British sets and accessories now have a reputation of which they should be equally proud.

The Municipal Tramways Association.

Annual Conference at Liverpool.

The twenty-first annual Conference of the Municipal Tramways Association was held in Liverpool from September 8th to 10th, under the presidency of Mr. P. Priestly, general manager of the Liverpool Corporation Tramways. The attendance was about the same as in the past few years, about 250 members and their ladies, and a number of guests. The programme for the Convention departed somewhat from custom in that the first and third days were devoted wholly to serious business, whilst the second day, Thursday, September 9th, was given up to an excursion to Llandudno and Menai Straits by steamer on the invitation of the Liverpool Corporation Tramways and Lighting Committee. Fortunately, splendid weather favoured this trip. In the evening those attending the Conference were received at the Town Hall by the Lord Mayor. The annual dinner was held at the Adelphi Hotel on September 8th, whilst on Friday, September 10th, a luncheon was given at the Adelphi Hotel by the Corporation Tramways and Lighting Committee.

Practically the whole of the Conference proper was devoted to a discussion of the financial position of tramways as affected by motor-'bus competition, and a critic might comment on the absence of any reference to the technical side of the industry. Nothing in the way of new developments in tramway rolling stock, for instance, was noted, whilst, on the other hand, in Mr. Baker's paper, reference was made to the improvements taking place in motor-'buses, and illustrations were given of the new six-wheeled 'bus ordered by the Wolverhampton Corporation. It is also a commentary on the proceedings of the Conference that there should have been a very fine display of the latest types of motor-'buses. Against this criticism, if it be such, is to be noted the fact that the whole position of possible future development in tramway rolling stock and line equipment has been carefully considered by a Joint Committee of the Municipal Tramways Association and the Tramways and Light Railways Association, and a report by that sub-committee was discussed at the Torquay Conference of the latter body in June, so that, to that extent, the technical side of tramway development has not been overlooked.

The proceedings of the Conference were marked by some frank expressions of opinion, and tramway managers and committees were warned that it was useless merely to wait or hope for legislation to get the tramway industry out of the difficulties with which it was faced as regards motor-'bus competition. It was agreed all round that the Bill which the Association was able to get introduced into Parliament early in the year, as a private member's Bill, dealing with this matter—which was defeated on second reading in the House of Commons by five votes—should be introduced again as soon as the first opportunity occurred, but emphasis was laid at the same time upon the necessity for tackling the whole problem of tramways from a different angle—namely, improving the equipment in such a manner that the tramcar, *per se*, will hold its own with the 'bus as regards speed, comfort, and appearance. Some of the latest types of tramcar have been a revelation in these respects, but, as has been pointed out on previous occasions, many of the tramway undertakings have allowed their systems to get into a dilipidated condition both as regards cars and track. Hence, at this Conference, as at the Torquay Conference of the Tramways and Light Railways Association, a strong point was made by some of the more progressive members that immediate attention should also be paid to the improvement of tramway systems generally, particularly as regards the elimination of noise. Mr. R. S. Pilcher, of Edinburgh, particularly stressed the point that there was now no excuse for noisy gears. Another feature of the Conference at Liverpool was the very small part which tramway managers took in the discussions, the Councillor members having it almost entirely to themselves. Perhaps that accounted for the lack of reference to the more technical side of the industry, although, as indicated, this is far from being neglected.

On Wednesday morning, in St. George's Hall, a civic welcome was accorded the Conference by Alderman Sir Archibald Salvidge, P.C., K.B.E., in the absence of the Lord Mayor of Liverpool (Councillor F. C. Bowring, J.P.), who had intended to welcome the members, but had been called to London on important business.

Sir Archibald Salvidge apologised for the absence of the Lord Mayor, extended to the visitors, on his behalf and that of the citizens of Liverpool, a very warm and cordial greeting, and expressed the hope that the visit of the Association to the city would prove of mutual advantage. Any matter affecting transport and its improvement, he said, was of very great interest to a city such as Liverpool. There was an enormous demand for passenger transport to-day; this demand must be met, and it was the business of the Conference to decide and consider by what means this great service could be improved throughout the country. In Liverpool the traffic problem was of great importance. Liverpool ended at its river front; there was a constant flow of vehicles of all descriptions down to the landing stage, forming a *cul de sac*, and this traffic, overflowing as it did into the streets of the city, led to enormous congestion. They were trying to solve this problem, and, although perhaps it was not a tramway question, he submitted that any question affecting transport and movement, whether it was in connection with passenger or industrial motor traffic, was one of supreme interest to an organisation such as the Municipal Tramways Association. In an effort to solve the problem, there was being constructed the largest tunnel in the world, not in length, but in width and dimensions, connecting the Lancashire and Cheshire sides of the Mersey. It would connect with the new Lancashire road which was being constructed right through Lancashire and Yorkshire, and which would thus link up, through the Mersey tunnel, Cheshire and the North of England, doing its best to grapple with the great problem of transport, whether it were industrial or passenger.

The Presidential Address was delivered by Mr. Priestly, and a hearty vote of thanks was accorded to him. An abstract of the address follows.

The President then presented the medals and prizes awarded for the best papers in an Essay Competition organised during the past year. The competition, he said, which was organised by a sub-committee of members of the Council, was very well received, and some excellent papers were written.

The awards were as follows:—

Mr. A. H. Boggis (a clerical assistant in the L.C.C. Tramways Department), first place for a paper on "Legal Burdens on Tramways." (Silver Medal and £15.)

Mr. J. W. Gunning (time-table clerk in the Liverpool Corporation Tramways Department), awarded a prize for his paper on "Traffic." (Silver Medal and £15.)

Mr. A. C. Baker (son of Mr. Alfred Baker, of Birmingham, and chief engineer to the Birmingham Corporation Tramways), for the best paper on "Organisation of a Rolling-Stock Department." (Silver Medal and £15.)

Mr. W. T. Richards (rolling-stock superintendent of the Rotherham Corporation Tramways Department), awarded a special silver medal for a paper on "Inter-running Arrangements with Other Authorities." (It was not intended to give a prize for this subject, but the paper was of such outstanding merit that the adjudicators thought it was worth a silver medal.)

Mr. E. W. Edmonds (senior technical assistant, L.C.C. Tramways Department), awarded the prize for a paper on "Organisation of the Traffic Department of a Street Tramway system." (Silver Medal.)

Mr. Stanley Dawson (overhead line clerk, Rotherham Corporation Tramways Department), awarded the prize for a paper on "Overhead Line Equipment." (Silver Medal.)

The names of the competitors were not known to the examiners, the papers being sent to them under numbers. The winning papers will be published later in the Association *Journal*.

Annual Dinner.

The annual dinner of the Association was held on Wednesday, September 8th, at the Adelphi Hotel, Liverpool, Mr. P. Priestly (president of the Association) in the chair.

Alderman T. DOWD (ex-Lord Mayor of Liverpool), replying to the toast of "The Corporation of the City of Liverpool," proposed by Sir John Timpson, K.B.E. (Portsmouth), spoke of the municipal work that was in progress in Liverpool; he mentioned that the Electricity Department contributed £120,000 to the relief of rates in 1924, and in 1925 even the Tramways Department, which seemed to please nobody, contributed £50,000 to the relief of rates. The new car sheds at Liverpool would be the largest and best equipped in the world.

Councillor T. WHITE, proposing "The Municipal Tramways Association," said that a record in passenger transport had been created in Liverpool in that during the past year 247 million passengers had been carried on the tramways. In addition to the £50,000 which had been contributed to the relief of rates in 1925, the sum of £80,000 had been paid in rates and taxes and £100,000 in respect of road maintenance. For these reasons—because burdens in respect of road maintenance and other matters were borne by tramways all over the country and not by competing forms of transport—the tramway undertakings of the country had no reason to be ashamed of what they were doing or of their position. Taking the members of the Association as a whole, he stated that the capital invested in their undertakings amounted to £94,500,000, of which £35,000,000 was in respect of permanent way, amounting to 4,500 miles. Over £1,000,000 annually was contributed in local rates, and over £2,000,000 had been paid in taxes under Schedule D. In addition to all this, over £2,000,000 had been paid for the repairs and maintenance of roads which, incidentally, the tramways did not damage. In all these circumstances there was a good deal more to be said for the tramway than was often said, and the tramway systems of this country were certainly not going to be knocked out with one blow.

The PRESIDENT, replying to the toast, said that if the tramways were only given a fair chance in the matter of competition from motor-'buses he had no fear but that they would again be successful both financially and in giving the public cheap transport. Private enterprise, however, must be placed upon an equitable basis in relation to tramways and not allowed the considerable advantages which it now possessed. Unfortunately, the Association had not been successful in getting its Bill through Parliament, although it had been lost by only a very small minority; but it was only by concerted action on the part of the Association that the tramway undertakings of the country would be able to achieve their aim. When the Association was formed 25 years ago, the capital invested in municipal tramway undertakings was £28,000,000 and the number of people carried per annum was 1,700,000,000. Now the capital was £94,000,000 and the number of people carried per annum had increased to 4,500,000,000. During the past year sub-committees of the Association and of the Tramways and Light Railways Association had been considering rolling stock and other technical matters concerned with the industry. He had been the chairman of one of these sub-committees, and he could assure them that the matter of jazzing tramcars, as they were called in the industry, was receiving very close consideration. Furthermore, the Association was represented on the British Engineering Standards Association, on the Safety First Committee, and on other bodies, so that it was covering a very wide field.

The final toast was "The Visitors," proposed by Alderman C. Higham (Blackburn) and responded to by Col. H. C. Woodcock, M.P. (Liverpool), one of those who voted against the second reading of the Association's Bill last session. Col. WOODCOCK congratulated the Association on the politic way in which it had invited the enemy to come within its camp, and learn for himself the great good which the municipal tramway undertakings of the country were doing.

Annual Meeting.

At the annual general meeting, which was held on Friday afternoon, Mr. R. L. Horsfield, general manager of the Cardiff Corporation Tramways, was elected President, and next year's Conference will be held in Cardiff.

The report of the Council was adopted, and the Council was instructed to proceed afresh with the Bill which was lost in Parliament by a narrow majority this year. A resolution was also passed changing the name of the Association to "The Municipal Tramways and Transport Association."

(To be continued.)

Presidential Address.

By P. PRIESTLY, A.M.I.E.E., M.Inst.A.E., *General Manager, Liverpool City Tramways.*

(Abstract.)

So far as magnitude is concerned, this Association, in its tramway systems alone, quite apart from the motor-'bus services operated by local authorities, represents by far the largest passenger transport agency in this country. The number of passengers carried by tramways in Great Britain in 1925 was 4,620,501,521, while the total number of passengers carried by all the railways in that year was 1,743,518,314. For every passenger carried on the railways nearly three were carried on the tramways. No critic has conceived the cost and the effects of substituting for tramways any other known method of conveying by road, over 100 times each year, every man, woman, and child in the kingdom. The interests of every local authority, as well as of the commercial community, are directly bound up with this great question of road passenger transportation. The annual cost of the upkeep of the roadway, used by all other vehicular traffic, last year was £2,168,000, which sum was a direct impost upon the users of tramways. Last year 707,000,000 Board of Trade units, which cost over £3,221,000, were used for operating tramways in Great Britain.

At the last Conference the Association expressed its resentment at the restrictions and the expensive procedure (and the delay which that procedure necessitated) imposed upon local authorities that were anxious to keep abreast of the public demand for passenger transport services by providing motor-'bus services in conjunction with their tramway services.

The Council considered the promotion of a Bill in Parliament conferring upon the Minister of Transport powers to deal cheaply and expeditiously with applications by local authorities to operate motor-'buses, and as the Government could not include suitable provisions in its Bill relating to public service vehicles, a private Bill was introduced into the House of Commons, but on March 12th it was defeated by the narrow margin of five votes—133 to 128. The Bill was opposed by an organisation of private 'bus interests and the Conference of Tramways and Light Railway Companies on one hand, and on the other, by those who raised the cry of "Municipal Socialism."

The public service which touches the people most closely, both in their private and business lives, is the means of locomotion. It is common ground that the efficient organisation and adequate provision of transport facilities vitally affect housing and health, as well as the development of new residential and industrial districts. It is no less true that the redundant provision of such facilities entails waste of every kind. The conditions in the Metropolitan area, which are probably unexampled in the world, are a distinct warning to the provinces. It has been found necessary, for the first time in the history of transport, to declare a large number of streets "restricted streets," and to put an end to competition, not only by enacting that no more vehicles shall ply for hire in such streets, but also by removing or restricting some of the vehicles already operating over them. This is a clear admission that the passenger transport service in our large cities is outside the scope of competition and that the principles of monopolies must be applied to it.

What is true of tramways, as well as of every other industry, is (1) that the cost of operation has greatly increased owing to the increase in wages paid to employés, with a decrease in the number of working hours; (2) that the provision for renewals on a pre-war basis is inadequate for post-war conditions; (3) that despite the vast improvement which has taken place in the operation of tramway undertakings, the pre-war fare is not yet an economic proposition.

In spite of the unfair conditions under which they operate, tramways are unsurpassed for the cheap conveyance of great masses of the population, and they have proved that no other vehicle yet placed upon the road can deal with the peak-load traffic in our great cities and industrial areas as economically and efficiently as they do. If the motor-'bus undertakings were placed on the same footing as tramways, and had to provide services at all times of the day, issue workmen's tickets at reduced fares, pay for the cost of maintenance of the roadways and pay rates on their undertakings—in addition to rates on their premises, &c.—it would be impossible for them to give the excellent services now provided by tramways at the present cheap scale of fares. As the motor-'buses have a much smaller carrying capacity than tramcars, there would have to be a large increase in the number of vehicles required to carry the people at peak-load times, which would increase the street congestion in the business portions of the different towns and cities.

Tramways do not fear fair competition, but it is unreasonable that they should be handicapped by having unfair burdens placed upon them, which actually relieve their competitors of just responsibilities.

Local authorities which operate tramways should have the necessary powers to run motor-'bus or trolley vehicle services to connect up the different tramway routes, and also to serve as feeders to the tramways by operating in the areas adjacent to the tramway termini. In addition, they should be allowed to join up with the transport systems of neighbouring authorities by providing tramcar, trolley vehicle, or motor-'bus services.

The general strike will leave a deep impression upon the finances of the members of this Association for the current year, because the loss in revenue that took place cannot be overtaken. The relations between tramway authorities and their employés were undermined by the action of employés in treating the National Agreement as a scrap of paper, bearing no obligation to, or consideration for, the employers and the community. If agreements are to be treated so lightly by the employés, it will have to be taken into serious consideration whether it is not futile to enter into National Agreements of this character.

A Defence of the Poor Manufacturer.

By A. J. SMITH.

The average person whose duties have not brought him into close contact with manufacturing circles would have every reason to be appalled at the national future if he were to base his conception of the shortcomings of a manufacturer upon a casual perusal of the advice which is daily addressed to him, and the offers of the enormous number of different outside experts whose knowledge is apparently required to enable him to perform the most usual and every-day functions.

One may read daily such statements as, "It is quite useless for the manufacturer to produce goods unless somebody shows him how to sell them." By inference or innuendo, the manufacturer is coming to be regarded in most people's minds as an insane and unthinking production machine; an automatic machine, in fact, which goes on producing long after it should have shut down. The goods once produced, the maker is then popularly supposed to have fulfilled the only function of which he is capable. From other sources, one may gather that the general level of education is such that the services of the letter-writer are still required in commercial circles now as they were amongst the illiterate population of these islands several hundreds of years ago. "Strong, forceful letters" are still offered. "Persuasive, powerful letters which will bring in payment" are still obtainable. Then, on the all-important selling side, there are experts who will show him how to sell his goods (usually referred to as "products") by writing letters about them, and rival experts who will have nothing but the columns of the popular Press. Printers will write his catalogue for him, others will reorganise the internal administration of his business for him; but whatever the service offered, there is no disguising the fact that the manufacturer is regarded as a very poor kind of individual indeed.

Now I maintain that the idea which has been gaining credence of late years is fundamentally unsound. The average manufacturer is not the poor ineffective body he is so generally represented to be. Taking as a typical instance the man who for many years has been engaged in the manufacture of some machine or appliance, whether he be actual manufacturer or executive, we may take it for granted that the design, the manufacture, and the ultimate sale of such has occupied the greater portion of his thoughts during that period; and the man who, during this length of time, has been engaged in exploring every avenue for the use of his plant, who has been handling varied inquiries for it from half the countries in the world, who has probably visited a good many of them, and has piloted a business through alternate boom and slump for any number of years, is on the high road to becoming an "expert" himself, both upon how such an article should be made, and how it should be marketed. Granted that no wise man has ever finished learning, one would at first sight suppose that the most suitable mentor would be another manufacturer with longer and greater manufacturing experience. But the outside expert's stand in this matter is an ingenious if not altogether convincing one. Though he may, upon close investigation, become merely a "man in the street" as far as experience in this particular trade is concerned, he is yet able to turn even this to account, and to point out the peculiar advantage which this affords him when it comes to giving advice. The manufacturer is too close to his subject; he cannot consider its problems impersonally; he has no perspective. The outside selling expert, knowing nothing of the goods or the business, is by reason of this very fact well situated for advising how the goods should be sold or how the business should be organised. He has the necessary perspective!

Somewhat similar in claims and in experience is the outside authority who specialises in the market survey. "Before any successful selling plan can be formulated, the sales resistance must be calculated with the most scientific precision." The unthinking might suppose that few people would be in a better position for gauging the demand, or estimating the possibilities of any market than the man who in his own interests has been working hard at them for a number of years with his position or his capital dependent upon results. Up-to-date opinion is otherwise. "This is a highly-specialised business, and essentially a job to be left to the professional expert." The manufacturer, however, will draw some consolation from the fact that in most of the surveys which are submitted for his instruction he will find many of his own ideas (if he has ever expounded them in preliminary discussion) are there dressed up and represented to him.

The manufacturer who may be tired of long years spent in daily and difficult correspondence is likewise able to invoke outside assistance, and for a suitable sum obtain compelling and forceful letters warranted to bring home the order, or whatever else be the object desired. "Letters with a punch" they are sometimes described by their authors, and although some of the methods employed to achieve the object may seem rather crude and the language more appropriate for the United States than for this country, they deserve to be studied as an interesting sidelight upon the mentality of the modern sales promoter as well as instructive examples of the extreme simplicity and ease with which it is apparently possible for him to achieve his desired object. On the selling side, there is, in fact, a plethora of plans and systems available. One day the manufacturer is offered a service by some financial house which is claimed to solve the problem of financing a successful foreign trade which, upon investigation, turns out to be an explanation of what a bill of exchange is and how it is negotiated; another day yet another key for unlocking the door of export trade may turn out to be a small directory.

Any lengthy experience of much of the service which is daily offered to a manufacturer makes one feel that if the exact knowledge which he himself has necessarily acquired as a result of many years' experience in the conduct of his own business were known and appreciated a little better by the average outsider, this would result in a considerable improvement of the quality of much of the service, as well as a slight alteration in the present method of approach which is apt to erroneously take it for granted that the person who knows least about his trade, about markets, and about selling methods, is the manufacturer!

E.P.E.A. and the General Strike.—In an address to members of his Association in Edinburgh, Mr. A. J. Ostler, president of the Electrical Power Engineers' Association, explained the reasons for the decision of the National Executive Council of the Association to maintain supplies during the general strike. As technical staff engineers, they had, while creating an organisation to establish proper standards of remuneration and conditions, never lost sight of the fact that their first obligation to their undertakings and to the public was to maintain continuity of supply. The domestic troubles in the industry had compelled them sometimes to use the "big stick." That was an action they would always recommend reluctantly, and it was only possible where the machinery of the Joint Boards had broken down. Gradually, but surely, the influence and authority of the Boards were increasing, and a better spirit of understanding between the two sides had developed. He believed that it was now only a matter of time when all supply authorities would be represented on the National Board. The ideal which the Association had ever to keep before it was that it should ultimately obtain a professional status for its members.

Mr. W. Arthur Jones, the general secretary of the Association, also spoke. The E.P.E.A., as much as any other organisation he said, would have to examine closely any Bills introduced which might weaken the legitimate authority of the Trade Unions.

Is there any Legal Claim to Trade Terms?

By A BARRISTER-AT-LAW.

THE subject of trade terms is a vexed question in most trades, not only as regards the amount of discount to be allowed to the trader, but also as regards the qualifications to be possessed by the trader before he can establish his claim to be genuinely entitled to terms.

The practice of giving discounts or special prices to retailers has become so firmly established as to amount to almost a custom. From time to time in the Courts the plea has been raised that a certain trader is entitled to the "customary" terms. But so far, although the Courts recognise the prevalence of the practice, it has been impossible to establish any legal claim to trade terms, owing, firstly, to the difficulty of defining what is a "genuine trader," and, secondly, to the impossibility of laying down what are the customary terms.

In no two trades and for no two commodities can it be claimed that a flat rate of discount is applicable. Twenty-five per cent. may be the usual thing, but nevertheless there are often large buyers who are allowed higher discounts, and there are many articles which are sold "to the trade only" at a fixed price, the trader fixing his own retail prices. All these points have hitherto made it impossible to claim any special terms by "custom of the trade." In a sense, therefore, it may be said that there is no legal right to trade terms.

The right to trade terms may, however, arise out of a contract express or implied. Take first of all the simplest case. A retailer writes to a manufacturer asking for prices. The manufacturer sends a traveller, or looks up the retailer in a trade directory, to find out what class of business the retailer is engaged in. Terms are then quoted, and in consequence of that quotation the retailer places an order.

Now it is an established rule in law that, if an offer is accepted unconditionally, a contract is made. And contracts once made must be fulfilled. In the example given above, the manufacturer makes an offer of trade terms which the retailer accepts. Accordingly, unless there has been fraud or mistake on the part of either party, trade terms must be given as quoted.

It becomes important, then, to consider what constitutes in law an offer on the part of a manufacturer, which can be turned into a binding contract by the placing of an order. A circular letter addressed to a trader, or a catalogue sent specially to him, quoting trade prices would generally be deemed an offer in law; but the mere publication in an advertisement or in a price list issued to both trade and public, stating that trade terms would be given to traders, would not constitute an offer of terms. And in any case, if a circular letter contained a statement that trade terms as quoted would only be given to persons who could show, to the wholesalers' satisfaction, that they were established traders, this would not be an offer which any person could accept by placing an order. To get trade terms in that case, the retailer would have to show an established business before his order could be accepted.

Generally speaking, an order is not an acceptance of an offer. Orders are not generally placed only after quotation. More often than not an order is sent in by a retailer, and nothing is said as to terms until the invoice arrives. Then, of course, the contract is made, and the retailer is bound to accept the goods at whatever price the wholesaler charges.

If the order is placed subject to some such condition as "usual trade terms" or at a certain figure "less 25 per cent.," the wholesaler, if he executes the order at all, must execute it at the terms mentioned. There is, of course, in general, no obligation upon a wholesaler to execute an order at all. Merely because he advertises in the trade Press, and indicates thereby his willingness to do business, he cannot be bound to carry out the orders of anyone who likes to send in.

So that here again a wholesaler cannot be compelled to give trade terms. He can refuse the order altogether; but where the order is placed under a condition, or in consequence of a quotation, the order, if fulfilled at all, must be fulfilled in accordance with the condition or the quotation.

There is perhaps one case in which a manufacturer can be compelled to execute an order sent to him. A quotation given in response to an inquiry does not always oblige the wholesaler to execute any orders which may come in as a consequence of that quotation, unless the quotation were so worded as to amount to a promise to accept orders.

Thus if the wholesaler quoted in these terms: "If you send your order this week we will dispatch immediately on receipt," the wholesaler would be in law bound to accept the order if it came in the proper time. If he quoted "our price to you is so much" and said no more, it is extremely doubtful if he need accept the order subsequently. There is all the world of difference between "we can supply" and "we will supply." The first merely indicates a willingness to consider orders if they are sent in. The second is an offer which if accepted by the retailer (by the sending of an order) must be carried out by the offerer.

There may be some advertisements, circulars or even catalogues which are couched in terms which indicate a promise to execute whatever orders are sent in; but generally the Courts lean against interpreting advertisements and lists in this way, and it is only when the promise is quite definitely expressed that the recipient of an order will be bound to execute it.

So that as the matter remains, wholesalers have the granting of trade terms entirely in their own hands. Where, however, a trader has once been given trade discounts, and he places orders on terms "as before" or "subject to usual terms," the wholesaler cannot refuse trade terms. His only course then, if he does not want to give terms, is to refuse the order altogether in the manner mentioned above.

A Wireless Beam for Ships.—Experiments with a new and comparatively inexpensive form of wireless "lighthouse," which may greatly decrease the difficulty and danger of navigating ships in fog and other adverse conditions, are being carried out by the Government. The *Daily Mail* states that a revolving wireless "beam" is radiated by the "lighthouse," and it is hoped that navigators in vessels fitted with a receiving set, 50 miles away or even more, will be able, by its means, to find their bearing from the "lighthouse" in a minute or so by simple calculation. Should the experiments be successful, it is possible that the Board of Trade may take steps to have a number of these "wireless lighthouses" set up at important points on the coast.

A test is being made at Gosport, near Portsmouth, by officials of the Department of Scientific and Industrial Research.

The device, as described to a *Daily Mail* reporter, consists of a loop aerial which revolves at a given rate. Just before the frame points north and south a short signal is transmitted by it, and this is followed by a continuous note as the frame sweeps round. Another short signal is transmitted just as the frame is about to point east and west, and this again is followed by a long, regular note, which continues till the frame has made a complete revolution and is about to point north and south again.

When signals are transmitted by this frame aerial a receiving station receives a maximum strength of signal when the frame is pointing directly to it, and a minimum strength of signal when the frame is exactly broadside on to it.

The signals are picked up by a ship's receiving set. When the special signal indicates that the frame is just going to point due north a stop-watch is started. When the continuous note fades away, indicating that the frame is broadside on to the ship, the watch is stopped.

The navigator knows how long the frame has taken to travel from a position where it pointed due north to a position where it was exactly broadside on to the ship. He can, therefore, rapidly calculate his bearings from the "lighthouse."

Since a ship due east or west of the "lighthouse" would obviously not hear the signal for north clearly, another signal is given when the frame points east, so that a vessel can always calculate its position without difficulty.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Electrical Equipment of Motor Cars.

In an editorial note in your issue of September 3rd, you mention that it is found, from the figures of the R.A.C. reports, that while ignition troubles caused 22.7 per cent. of breakdowns sufficiently severe to require the use of the "Get-you-home" service, failure of engine-starting equipment caused only 0.5 per cent. of such breakdowns. You remark that it is "perhaps contrary to expectations" that the latter figure should be so low. Perhaps I can supply the reason, for I think it would be erroneous to infer from these figures that the ignition fails about forty-five times as often as the starting motor. Whereas ignition failure can reduce even an expert to tearing his fair and sitting down on the roadside to wait for an R.A.C. patrol, the failure of the starting equipment is very easily overcome by anybody—by using the starting handle, by running the car down an incline, or by persuading the passengers (if any) or lookers-on (there are always plenty of these!) to shove—or even by allowing a delighted horse to tow his dead mechanical usurper a few yards along the road until it wakes into life. It is very seldom that a breakdown of the starting motor means a breakdown of the car, while a breakdown of the ignition very often means that. Therefore I take it that the 0.5 per cent. of starting-motor breakdowns is not so accurate a proportion of total failures as the 22.7 per cent. of ignition breakdowns.

The moral of all this is, as has often been pointed out, that statistics require intelligent interpretation. Everybody knows the story of the two expert and highly-trained statisticians who prosecuted a bitter private war because the one had proved that cats' tails were getting longer, and the other that they were getting shorter. Happily, they made it up and found peace, by investigating the enthralling subject of cats' whiskers. Now they only argue about heterodynes and Heaviside layers.

R. Twigg.

Gt. Malvern, *September 6th*, 1926.

Boiler-Room Efficiency.

I should be glad if you would allow me a portion of your valuable space to point out to the powers that be a few details that in the writer's opinion would all tend to add to the efficiency of the boiler-room results. First, the instruments: Why cannot an instrument tester be employed whose job is solely to keep all instruments in proper working order. Believe me, it is one man's job to keep all the CO_2 recorders accurate alone, and to expect the combustion engineer to do this is simply taking him away from his proper job. He cannot be expected to maintain good results when CO_2 instruments are all anyhow, and how can he be paying attention to important matters when for hours he is trying to trace an air leak and then is expected to take pipework down and clean it out? The combustion engineer's job is to look to the efficient combustion of fuel and he should be able to tell by his instruments whether he is doing so or not, but if 50-60 per cent. of the instruments and gauges are wrong, how can this be done? Instruments are expensive items, but in the boiler-room, once they are fixed that is enough; they are subject to harder wear and tear than any other instrument or gauge in the station, but are neglected solely because the combustion engineer has not any time to be a repairer and tester of gauges, CO_2 recorders, &c. It is most important that these be kept accurate. A false reading on these often means more loss to the company than a false ammeter or wattmeter, but if the wattmeter is found to be at fault the electrician is sent for immediately. Why is it that still in these days anything will do for the boiler-room? When will the authorities realise that these gauges, recorders, &c., are to the combustion engineer what the voltmeters, ammeters, and wattmeters are to the control engineer, with the difference that in the boiler-room faulty readings mean more loss to the company? Yet on top of all his other duties the combustion engineer must put them in order and leave his other duties for this purpose. Next (I hope I won't get the sack for saying so), the superintendent should call meetings with his combustion engineers and talk conditions over each week. Very many improvements in the running can be made by having these meetings; difficulties can be mentioned and ways found to overcome them, different ideas can be tried and perhaps better results obtained thereby. Surely it does no harm for the superintendent to listen to suggestions from the men who work the boiler-room. A suggestion book should be kept and looked over each week, and suggestions should be talked over during these informal meetings. Then as regards the combustion engineer's position; he should be given sole control of the boiler house and be held responsible for it, and all orders for the leading firemen and stokers should come directly through him and nobody else. At a station the writer knows this is not always done; the combustion engineer's authority is lowered with the men through this; and many of his orders are not carried out. For efficient results strict discipline is essential, and the boiler-room must be run in the manner the combustion engineer orders, not as the leading fireman wishes; this will only be done when the leading hand is given strict orders by the superintendent to obey the engineer responsible for operation. To obtain good results it is perfectly useless for somebody to come along and give an order, and then immediately afterwards for the combustion engineer to come along and find that something is taking place of which he was totally unaware. How can he be held responsible for poor results if this continues? Combustion engineers are usually as keen and hardworking as anybody to show good results, so that every week, good or bad, they must know exactly how the results are going; they are out to do their best, and every bit of information is needed by them. They sometimes deserve praise as well as blame, and if they receive one of these, well, let them have a bit of the other sometimes; if they have tried to do their best and work under the conditions advocated in this letter, I do not think they will often need to be blamed, and I am sure the efficiency of the boiler-room will increase.

A Combustion Engineer.

September 8th, 1926.

Overhead Line Construction.

With reference to the article "Minor Aerial Power Lines," by Mr. R. Grierson, in the issue dated July 16th, which I have only just read, I might point out that in the Electricity Commissioners' Regulations El.C.39, Page 4, under "II.—Specific Regulations," Clause 11, which would govern the design of an overhead line for 240 volts, d.c., states that the radial thickness of ice coating on the wires is to be taken as one quarter of an inch: not one half-inch as Mr. Grierson has stated.

This would mean that his 30-ft. medium single pole would carry the wires on span lengths of 240 feet—the maximum dip in the conductor being 3.2 ft. approx. By taking ½ in. of ice he has increased the cost of his 1,000-yard line by the price of 7 poles.

The ½ in. ice covering is only required to be assumed when the pressure to earth exceeds 650 volts, d.c.

In the British Insulated Cable Co.'s Overhead Line Pamphlet P192, dips are given for wires with both ½ in. and ¼ in. ice covering.

J. A. Morton.

Prescot, *September 11th*, 1926.

Legal.

Alleged Fraud.

At the Hull Police Court, on September 9th, the hearing was commenced of eight charges of obtaining money by false pretences and forging promissory notes, &c., against Edward W. Clark, an engineer. Mr. Payne, for the prosecution, said that the prosecutor in the first five charges was Mr. W. E. Shuttleworth, of the Humber Electrical Engineering Co. He had been induced by the defendant to lend him monies for the development of a patent. Mr. Shuttleworth was to receive a proportion of the profits upon the sale of the patented article, a tail shaft protector for ships. The prisoner represented to him that he had received orders to the value of £30,000, and it was suggested that these should be dealt with by Mr. Shuttleworth's firm. The prosecution proposed to show that letters purporting to be orders from certain firms were not from the firms at all. Later the defendant said that Sir George Thurston, chief naval architect to Vickers, Ltd., was interested in his invention, and was trying to form a company to exploit it. He also pretended that he had authority to sign promissory notes on behalf of Sir George Thurston, and obtained money by this pretence. Mr. Shuttleworth stated that he had been defrauded of over £8,000.

The prisoner's Counsel, Mr. Eustace, reserved his defence, but said that he wished to point out that Clarke had been in touch with a man who called himself Sir George Thurston, and believing the man to be genuine, found himself in the hands of a gang of swindlers who had led him on.

The hearing was adjourned.

Fraudulent Use of Electricity.

At the Kingston County Police Court, on September 9th, Geoffrey Hall, described as an electrical engineer, was charged with the fraudulent use of electricity supplied by the Wimbledon Corporation. It was stated that after the defendant had left his shop it was found that the connections had been altered so that electricity for lighting was registered by the power meter. In his defence the defendant denied fraudulent intent, and said that he made temporary connections to enable the new tenants to secure light. He was found guilty and fined £10 and ordered to pay ten guineas as costs.

To Old Ellesmerians.—The Governors of Ellesmere College, Shropshire, appeal to all "Old Boys" to be present on September 30th at the laying of the foundation stone of the Memorial Chapel of the College, in memory of those who fell in the war.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Northern Ireland Radio Exhibition.—On September 7th, the Lord Mayor of Belfast opened an exhibition at the Ulster Hall arranged by the Ulster Wireless Traders' Association. The show remained open for the rest of the week.

The Cologne Fair.—The Cologne Autumn Fair opened on September 12th and closes to-day (Friday). France, Austria, and Switzerland are well represented, but there are few British exhibitors.

Lead.—Messrs. James Forster & Co., reporting on September 11th, stated:—"The position of supplies is not too favourable. There is just enough lead arriving in London to meet the demand, but a shortage is reported in the outports, where premiums have been paid to obtain prompt delivery. Demand from the Continent is very quiet at the moment, and with the American market on the easy side, the prospect for the next few weeks is for a steady market with small fluctuations."

A Mullard Trade Reunion.—On Friday last, the Mullard Wireless Service Co., Ltd., and the Mullard Radio Valve Co., Ltd., gave a luncheon to some 120 of their business friends at the Holborn Restaurant, London. The toast of "The Guests" was proposed by Prof. G. W. O. Howe, D.Sc., who had just returned from the Berlin Wireless Exhibition, and gave some interesting particulars regarding its organisation. Capt. Ian Fraser, C.B.E., M.P., responding, referred to the trade in radio valves, regarding the figures as depressing: last year the exports of British-made valves were valued at £183,000; for seven months of this year the amount was £88,000. Last year the imports of valves amounted to £134,000; this year (seven months) the figure was £89,000. Holland sent £35,000 worth, France £22,000, Germany £5,000, and America £2,100. The competition was not one of quality but of price, due to the easier manufacturing conditions abroad, and the trade depression at home which made people buy the cheapest rather than the best. The differences which had existed in the trade were now removed, and they looked forward to a period of prosperity in the near future. Mr. W. Crawford also responded. Mr. A. Galloway proposed "The Mullard Companies," and Mr. S. R. Mullard, M.B.E., responding, attributed the low exports of valves to the lack of export of British-made radio sets. The Mullard companies now employed over 500 persons, and their association with the Philips company gave them the benefit of that concern's researches. Having recently carried out successful missions to the Dominions, he drew attention to the enormous value of the assistance that had been rendered by the Department of Overseas Trade. Let makers of sets take their courage in both hands and develop their oversea trade. The new united Valve Manufacturers' Association would give real service to the trade. Mr. C. O. Stanley proposed "The Industry and Press," the respondents being Mr. H. O. Dainty and Mr. W. E. Warrilow.

Bradford Street Lighting.—Several miles of gas-illuminated streets in Bradford are to be converted to electricity, and the new method of lighting will be controlled by "Newbridge" time switches manufactured by the Horstmann Gear Co., Ltd.

Our Foreign Trade.—The following were the values of imports and exports of electrical goods and machinery during August:—

	Aug., 1926.	Inc. or dec.	8 months, 1926.
Imports—	£	£	£
Electrical goods and apparatus	288,728	− 35,544	− 416,911
Machinery	871,237	−130,867	+ 457,211
(Electrical machinery)	76,842	− 29,290	+ 13,012
Exports—			
Electrical goods and apparatus	941,912	+164,148	− 537,974
Machinery	3,742,126	−423,249	−2,150,854
(Electrical machinery)	462,412	− 25,994	− 224,275
Re-exports—			
Electrical goods and apparatus	10,817	− 49	− 52,131
Machinery	111,450	− 58,948	− 163,334
(Electrical machinery)	9,478	+ 5,275	+ 15,680

The British Industries Fair, Birmingham.—The Birmingham Chamber of Commerce, which is responsible for the organisation and control of the Birmingham and Midland Section of the British Industries Fair, is enlarging the exhibition buildings at Castle Bromwich. Workmen commenced operations last week. It is proposed to widen each of the three huge exhibition halls by 73 ft. Hall A (near the main road of Castle Bromwich) has a length of 360 ft., and halls B and C a combined length of 620 ft. At the present time the halls have a total letting space of 85,000 ft.; when the extension is made this space will be increased to 125,000 ft. There is reason to believe that the additional 40,000 ft. will be fully taken up, as 90,000 ft. has already been let to 400 exhibitors. With the much wider front, it is intended to erect in a central position an attractive entrance, with wide swinging doors and six turnstiles. The old main entrance will become the exit door.

Indian Electrical Imports.—The *Board of Trade Journal* states that the imports of electrical machinery into India during the quarter ended June 30th were valued at Rs.59 lakhs, as compared with Rs.54 lakhs in April-June, 1925. At the same time the value of imported electrical instruments and apparatus rose from Rs.59¼ lakhs to Rs.65 lakhs. The share of the United Kingdom, however, fell from 40¼ lakhs to 38¾ lakhs. German imports rose from 6 to 7¼ lakhs, Italian from 2 to 3 lakhs, and United States from 4¼ to 10 lakhs. Imports from the Netherlands and Japan were lower.

Pension Funds.—We have received from the Industrial Welfare Society, 51, Palace Street, Westminster, S.W.1, a copy of its latest brochure on "Superannuation Schemes and Methods of Making Provision for Dependents of Employés." Copies can be obtained from the Society at 2s. 6d. The matter has been brought together to meet the requirements of numerous inquirers among industrial employers, and we commend the brochure to those of our readers who are, or who should be, interested in the subject generally and are desirous of examining different kinds of schemes that are in operation. The objects and elementary principles of pension schemes are discussed, while the constitution of funds and rules of membership, provision for widows and orphans, group life assurance, and other points are dealt with in useful form.

Electrical Demonstration at Woking.—The WOKING ELECTRIC SUPPLY CO., LTD., is continuing its activities in the popularisation of electricity. At a recent football and hospital carnival in the district the company erected the stand illustrated in the accompanying figure, and equipped it with all kinds of domestic electrical appliances. During the day several thousand people were attracted to the marquee in which the stand was situated by demonstrations of cooking, washing, ironing, &c. Much good is expected to result from the display.

An Electrical Demonstration at Woking.

Belgium and Reparations.—In reply to questions put by a German correspondent, the Belgian Minister of Railways is reported to have stated that he regarded it impossible in principle to solve the reparation problem by way of deliveries in kind. Of course, comprehensive orders for the German electrical industry were held in prospect on reparation account in connection with the reorganisation of the Belgian telephone and telegraph systems. But the allocation of further orders to the German electrical and other industries would be determined entirely according to the development of Belgian economic and financial conditions, as it was necessary to exercise economy in the interest of the restoration of the finances.

Local Exhibitions.—HALIFAX.—The Halifax Corporation Electricity Department's exhibition of domestic and other electrical appliances was intended to be for a fortnight, but in view of the continued coal emergency the Electricity Committee decided last week to close the exhibition at the end of one week, and therefore it concluded on September 11th instead of September 18th.

WEST HAM.—An electrical exhibition under the auspices of the Corporation Electricity Department was formally inaugurated by the Mayor on September 13th at the Stratford Town Hall. A variety of domestic appliances were displayed by a number of leading firms. Further details will appear in our next issue. The exhibition closes to-morrow (Saturday).

Halifax Contractors' Scheme.—The members of the Halifax branch of the Electrical Contractors' Association have undertaken a two weeks' publicity campaign by means of joint newspaper advertising and specially reduced prices of goods on sale. The advertisements give the names and addresses of the members participating in the scheme and sharing the cost.

German Share Quotations.—In connection with a further rise in the quotations for German electrical shares on the Berlin Exchange, it is stated that systematic purchases of Siemens & Halske shares for American account are continuing. It is also said that a large American electrical firm has opened negotiations with the Siemens-Schuckert group for the purpose, *inter alia*, of undertaking a big scheme for the reorganisation of the Russian telegraph and telephone systems.

New Municipal Showroom.—WILLESDEN.—As we briefly mentioned in our last issue, the Willesden U.D.C. Electricity Department (engineer: Mr. A. W. Blake) opened a new showroom on September 9th. The Council is probably the largest, and is certainly one of the oldest, bulk-supply distributing authority in the country. Its agreement with the North Metropolitan E.P.S. Company dates back to 1904. It now has nearly 11 000 consumers, and its maximum demand is in the neighbourhood of 10,000 kW; in 1925-26 the Department purchased 20,282 490 kWh.

The showroom is a part of a block of new premises, adjacent to the Department's office, which the Council has acquired. All types of apparatus are on view, including "Tricity" cookers, "Bastian" and "Genii-Vectis" water heaters, and a "Magnet" washing machine and ironer, in addition to a complete range of fires and the smaller electrical appliances. The Department hires out three types of cooker, for 3, 6 and 10 persons, respectively, at a cost of 6s., 7s. or 8s. per quarter, including maintenance. The water heaters are let out at a charge of 3s. per week, including energy. They are permanently on circuit, and have a loading of 200 W, giving a supply of water at 160 deg. F. Vacuum cleaners can be hired by the day. Any appliance costing more than £2 can be sold by hire-purchase, and contractors who introduce customers are given a commission. The Department has an assisted wiring scheme for owner-occupiers of houses up to 15 lighting points, with extra plug points. The payment is spread over one, two, or three years. The practice is to give the job of wiring a house to the contractor who introduces a customer. If the client is secured otherwise, three contractors in his district are asked to tender, and the most favourable offer is accepted. Behind and above the showroom are new stores, and it is proposed to convert the basement into a cooking and washing demonstration room. In the yard of the new premises is a garage and charging station for six of the Council's electric dust-collecting vehicles. The Department is now provided with practically all that it needs in the way of accommodation. It has cooker and motor maintenance departments, meter-testing rooms, a blacksmiths' and fitters' shop, and a painters' and joiner's department. The offices are roomy and bright, and the welfare of the staff (150) has been taken into consideration. There is a recreation room of sufficient size for concerts and whist drives, as well as a billiard room. The showroom is in the charge of Mr. W. S. Hind, commercial assistant.

A Siemens "Milometer."—To draw attention to the company's electric lamps, the Siemens and English Electric Lamp Co., Ltd., is issuing to lighting users a folder which, in addition to particulars and prices of lamps, contains a "milometer." This consists of a map of England and Wales with a celluloid strip pivoted at London. The distances of the principal towns from the metropolis can be read off the graduated edge of the strip.

Trade Announcements.—THE CHLORIDE ELECTRICAL STORAGE Co.'s Irish representative, Mr. E. C. Hart, has removed to more convenient premises at 8, Pearse Street, Dublin. On and after September 20th the Manchester Exide sales depôt will be at 18, Bridge Street, Manchester.

MESSRS. A. C. COSSOR, LTD., have joined the Electric Lamp Manufacturers' Association. Since 1890 they have specialised in small electric lamps for automobiles, miners' lamps, scientific purposes, &c., but they are preparing a general catalogue of electric lamps.

The business of GEORGE H. ALEXANDER REPETITION, LTD., of Pool Lane, Langley, Birmingham, is shortly to be absorbed by a new company—M.C.L. & Repetition, Ltd.—which will undertake to complete all contracts of the former. All accounts will be paid in full, and there will be no change in the management or staff.

Messrs. RICHARD JOHNSON & NEPHEW, LTD., notify that their London office is now at 22-26, Broad Street Avenue, Blomfield Street, London, E.C.2. Telephone numbers unaltered: "London Wall 9400, 9401."

The ALTON BATTERY Co., LTD., Alton, Hants., has appointed Mr. W. R. Hall to act as its representative for Lancashire, Cheshire, and North Wales, with headquarters at 37a, Victoria Buildings, Manchester.

Catalogues and Lists.—"M.K." ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.—A comprehensive catalogue of plugs and sockets, switch-plugs, tumbler switches, distribution boards, and other electrical accessories. Priced.

THE HORSTMANN GEAR Co., LTD., Newbridge Works, Bath.—An illustrated folder describing an electric time switch conversion set for gas street-lighting lanterns.

SUPERLAMP, LTD., 92 and 94, Paul Street, E.C.2.—A net trade price list of radio material and apparatus. Also a leaflet advertising "Supaul" outside lanterns.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—An illustrated pamphlet describing "M. & C." electric shaker conveyors.

MESSRS. HANS RENOLD, LTD., Didsbury, Manchester.—Publication No. 8,006, dealing with chains for elevating and conveying materials.

THE MARCONIPHONE Co., LTD., 210-212, Tottenham Court Road, W.C.2.—Publication No. 446, containing illustrations and prices of "Marconiphone" and "Sterling" radio components, with instructions for the making-up of various types of receiving sets. Also an illustrated booklet describing the manufacture of radio valves. Details and prices are given of all types of "Marconi" valves.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—September stock list of motors and dynamos.

MESSRS. E. BROOK, LTD., Empress Works, Huddersfield.—Folder No. 139, containing a list of provincial and Colonial agents for "Brook" motors.

MESSRS. HOPKINSONS, LTD., Britannia Works, Huddersfield.—List No. 1,940, dealing with the company's patent steam traps.

HART ACCUMULATOR, Co., LTD., Stratford, E.15.—A coloured showcard (15 in. by 10 in.), advertising the company's "Ray" h.t. radio accumulators, with prices.

THE GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2.—Bulletin No. 22, describing in detail, with profuse illustrations, "G.E.C." oil circuit breakers.

SIEMENS & ENGLISH ELECTRIC LAMP Co., LTD., 38-39, Upper Thames Street, E.C.4.—September price sheet of electrical material and appliances; and List No. 156, containing prices and illustrations of "Silvaray" glassware for lighting purposes.

MESSRS. VERITYS, LTD., Aston, Birmingham.—Catalogue No. 1,012 (80 pp.), containing illustrated particulars and prices of a wide range of "Maxlume" industrial and general lighting fittings.

MESSRS. E. GREEN & SON, LTD., Wakefield.—A well-illustrated booklet dealing with the company's patent "Tri-Tube" horizontal economiser.

MESSRS. FREDERICK THOMAS & Co., 189, Drummond Street, N.W.1.—An illustrated price list of alabaster bowls for electric lighting. It contains notes on the care of alabaster.

MR. C. W. ROBINSON, 11-14, Portsea Mews, Portsea Place, Connaught Street, W.2.—A mailing card advertising electrical apparatus and equipment for hire and sale.

MR. J. A. BROOK, 24, John William Street, Huddersfield.—A folder and blotter advertising the "J.A.B." electric lamp lock.

THE WHITWORTH ELECTRIC LAMP Co., LTD., 195, North End Road, West Kensington, W.14.—A price list of electrical material, fittings, and apparatus, and radio equipment.

COVENTRY ELECTRICAL ACCESSORIES, LTD., Conduit Yard, Fleet Street, Coventry.—A price list of electrical materials and appliances, and a separate pamphlet dealing with domestic apparatus. Illustrated.

Bankruptcy Proceedings.—V. FIGGINS, 97, Fore Street, St. Marychurch, Torquay, electrical engineer.—The receiving order herein was made on August 27th, on a creditor's petition. The statement of affairs shows gross liabilities of £934, of which £892 is expected to rank, against net assets of £79, leaving a deficiency of £813. Debtor attributes his failure to overstocking, a heavy loss on auction sale of stock and a motor car under executions, and law costs. He commenced business at the end of 1924 with £20 and £20 worth of stock and tools. In January last creditors began to press for payment and judgment costs of £40, and caused executions to be levied in June, under which a sale was held and £156 realised. This amount less auctioneer's charges and costs of execution is the principal asset scheduled by debtor, who estimates his loss on the sale at £495. Debtor alleges that he lost nothing on the contracts completed by him. He first became aware of his position in June last, and has done very little work since, and has not contracted fresh debts. First meeting held September 14th, at the Official Receiver's offices, 67, High Street, Exeter; public examination October 7th, at The Castle, Exeter.

PERCY F. BRITTAIN (trading as Brittain's Electric Motor Co.), 110, Cannon Street, E.C., and elsewhere.—The first meeting of creditors was held at Bankruptcy Buildings, W.C., on September 10th. Mr. Walter Boyle (Senior Official Receiver) presided, and reported that the debtor commenced business as an engineer about 1896. From 1898 until 1912 he was chiefly engaged on agency work. During 1912 he acquired the assets of an engineering concern for approximately £3,000, and took premises known as East Down Works, Lewisham, where he commenced business as an electric motor manufacturer under the style of Brittain's Electric Motor Co., and still retained his London office. The business had been successful until the industrial strikes commenced. He had successfully weathered seven strikes, but owing to the recent general industrial crisis and the continuance of the coal dispute, the supply of electricity had been restricted. In consequence of these drawbacks, coupled with foreign competition, he had experienced considerable difficulty in selling his machines. During 1920 he increased his business expenses (to meet an anticipated boom) to the extent of about £3,000 per annum, but instead of a rapid increase in trade, a slump set in, and stock values depreciated. This involved him in considerable capital loss, and trade had gradually diminished. In consequence of the lack of ready capital, his business had come to a standstill, and he could not withstand the pressure of creditors without some immediate financial assistance. Being unable to meet two execution creditors' claims, he decided to file his petition to protect his other creditors. He estimated his liabilities at be-

tween £2,000 and £3,000 due to about 50 creditors. He did not consider he was insolvent, and attributed his present position to lack of ready capital due to industrial conditions. He had scheduled assets valued at more than £17,000. A solicitor representing the debtor asked the creditors to adjourn the meeting in order that the debtor could approach his friends with a view to getting their help to pay the debts. The sum of £1,000 had already been promised. The creditors agreed to an adjournment until October 8th for this purpose. A resolution was passed for the continuance of the appointment of Mr. Hodgson as special manager of the business.

F. S. HALL, plumber and electrician, 189, Gatley Road, Gatley.—Receiving order made September 3rd on debtor's own petition.

F. E. KINZETT, trading as F. E. Kinzett & Son (other than Eric Francis Kinzett, a minor), wireless factor, 54, Fielding Road, Chiswick.—First meeting September 22nd, at 29, Russell Square, W.C. Public examination September 28th, at the Court House, Brentford.

C. HUBBARD, electrician, 13, Magdalen Street, Norwich.—Last day for proofs for dividend, October 2nd.; trustee, Mr. C. B. L. Prior, Official Receiver, 9, Queen Street Chambers, Norwich.

Company Liquidations. — FULLER'S UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath.—Under the liquidation of this company the first meetings of the creditors and shareholders were held on September 9th, at the London Bankruptcy Court. The winding-up order was made on June 1st upon the petition of Mr. R. H. Symonds, iron and steel merchant, a creditor for £1,909. Mr. G. D. Pepys, Official Receiver, reported that the company was registered as a public company on March 13th, 1919, with a nominal capital of £500,000, divided into 250,000 8 per cent. cumulative participating preference shares and 250,000 ordinary shares of £1 each, to acquire and take over as a going concern the business of four companies:—The Fuller Accumulator Co., Ltd.; John C. Fuller & Son, Ltd.; Fuller's Wire and Cable Co., Ltd.; and Fuller's Carbon and Electrical Co., Ltd. The business was originally established in 1875 by Mr. John C. Fuller, who was one of the pioneers in the invention and manufacture of electrical batteries, and it was stated that the four undertakings above mentioned were successful from their incorporation. The businesses included the manufacture of accumulators, cables, batteries, ebonite and carbon black, and there were depôts and branches in various places in this country and abroad. The first directors were G. Fuller, L. Fuller, G. J. A. Fuller, D. A. Palmer, J. J. Jarvis, and F. J. Gordon. They were all interested as shareholders or directors of the four vendor companies. At the date of the winding up the directors were F. R. Wade (chairman), W. L. Topple, C. H. Wayte, L. Fuller, and R. P. C. Wilson. Most of the directors also had service agreements. It was stated that prior to 1923 the directors made voluntary reductions of salaries. The statement of affairs showed that directors' fees paid since January, 1923, amounted to £6,780, and directors' salaries, as distinct from fees, to £16,531.

By the sale agreements, dated March 18th, 1919, the undertakings of the four vendor companies and all their assets, excepting book debts to be used in discharging old liabilities, were acquired by the company for £200,000, of which £50,000 was satisfied in preference shares and £150,000 in ordinary shares. The purchase price was fixed by the vendors and agreed to by the directors without any independent advice as to the value of the assets.

By an agreement dated April 7th, 1919, between the company and George Clare & Co., Ltd., the latter undertook to subscribe for 200,000 8 per cent. cumulative participating preference shares. These were issued to the public, and the proceeds were afterwards paid to the company. In July, 1920, the company issued £200,000 7 per cent., tax-free, short term notes, repayable in 1925. The due date of the notes was postponed, under a scheme of arrangement sanctioned by the Court, until 1932, and the interest was then reduced to 5 per cent., payable out of profits only. By a special resolution the nominal capital was reduced in 1921 to £378,794 by writing off from each of the 151,507 issued ordinary shares the sum of 16s. per share. On October 11th, 1921, a debenture for £150,000, charged upon all the assets, was issued to the company's bankers (the National Bank of Scotland, Ltd.) to secure the overdraft. That debenture was discharged in 1923. Owing to the trading losses the nominal capital was further reduced in 1922 to £231,061 by cancelling 14 preference shares which had been forfeited, and by writing off 10s. per share from each of the remaining 249,986 preference shares, and 3s. per share from each of the 151,507 issued ordinary shares. At the same time the unissued 98,493 ordinary shares of £1 each were sub-divided into 20 shares of 1s. each, and the nominal capital thus became £231,061. The company's trading for the first year showed a profit of £48,045, and a dividend of 10 per cent. per annum was paid on both the preference and ordinary shares. The results for the following three years to January 31st, 1923, however, were unsatisfactory, and a loss of about £283,000 was incurred. Eventually a scheme of arrangement was sanctioned by the Court on January 30th, 1923, providing for (*inter alia*):—The creation of £200,000 6 per cent. first mortgage debenture stock, containing a specific charge upon the fixed assets and a floating charge upon the general undertaking, of which £180,000 was to be issued and dealt with as follows:—To be accepted by the National Bank of Scotland in exchange for existing debentures (surrendered), £100,000; to be subscribed for in cash by existing 7 per cent. note holders and preference shareholders, £80,000. Those debentures were created on May 17th, 1923. Apparently only £45,539 was subscribed, of which £20,000 was repaid to the bank on account of the secured indebtedness; the balance of £20,000 due to the bank was left as a loan collaterally secured by the issue of first mortgage debenture stock. The present amount of this stock issued was £200,000 (interest £4,111), of which £147,461 was held by the bank. The scheme of arrangement also provided for the creating of £260,000 7 per cent. income debenture stock secured by a charge on the company's undertaking, ranking after the first mortgage debenture stock. The maturity date was fixed at 1932, and the interest was contingent upon and payable only out of profits earned in each year. The income debenture stock was created September 5th, 1923, and was to be issued as follows:—£200,000 to the 7 per cent. short-term noteholders upon their subscribing for first mortgage debenture stock to the extent of 25 per cent. of their noteholding; £60,000 in satisfaction of the claims of trade and other creditors, including the unsecured indebtedness to the bank. The scheme further provided the right to an allotment of one 1s. fully-paid ordinary share for each £1 of stock taken up by the noteholders and the preference shareholders. In October, 1923, 43,990 ordinary shares of 1s. each and in March, 1924, 1,549 ordinary shares of 1s. each were allotted as bonus shares in accordance with the scheme. The present amount of issued debenture stock was £187,758. The amount of the short-term notes outstanding was about £65,600. On September 1st, 1925, a prior lien debenture for £75,000 at 6½ per cent. interest, repayable at the rate of at least £15,000 per annum (the first payment being due on March 31st, 1926) was issued to the bank in respect of further cash advances to that extent. The first repayment was made possible by a special loan from the bank secured by the issue of £13,000 first mortgage debenture stock. The present amount outstanding was £60,000 and £1,950 interest. In consideration of their agreeing to the creation of the prior lien debenture in front of their own securities, the interest payable to the 6 per cent. first mortgage debenture stockholders and the 7 per cent. income debenture stockholders was increased to 6½ per cent. and 7½ per cent., respectively, by means of trust deeds dated March 12th, 1926. The issued and paid-up share capital was shown in the statement of affairs at £134,845, consisting of 197,046 ordinary shares of 1s. each (of which 150,000 were issued as fully paid to the vendors, 45,539 issued as fully paid as a bonus under the scheme of arrangement, and 1,507 issued for cash and paid for), and 249,986 preference shares of 10s. each (of which 50,000 were issued as fully paid to the vendors, and 199,986 were issued for cash and paid for in 1919). The trading results in 1924 and 1925 were better than previously; no accounts were issued for the year to March 31st, 1926, and the results for the whole period showed a loss of approximately £100,000. On April 29th, 1926, Sir John Mann, K.B.E., of 8, Frederick's Place, Old Jewry, E.C., was appointed by the bank as receiver in consequence of the non-payment by the company of the sum of £71,010 then owing to the bank on the working account (with interest thereon amounting to £2,370), payment of which had been demanded owing, it was understood, to certain executions levied at the company's works, and he then entered into possession of the assets. On May 4th, 1926, the Court appointed Sir John receiver and manager on behalf of the bank as holders of the prior lien debenture and of the National Bank of Scotland London Nominees, Ltd., and others, the holders of the first mortgage debenture stock.

The directors estimated the assets (consisting of freehold land, buildings, machinery, stock and book debts) at approximately £236,256. The business was being carried on by the receiver with the view of selling it as a going concern, either as a whole or in separate departments, and it appeared that certain negotiations were pending which, if successful, should result in the payment in full of the prior lien debenture, and a distribution to the first mortgage debenture holders, but it was doubtful whether sufficient would be realised to pay the latter group in full. In those circumstances it appeared that any return to the income debenture holders was very remote, and consequently there was no prospect of a dividend for the unsecured creditors, or any return being made to the shareholders. The liabilities of the company amounted in the gross to £603,049, and comprised prior lien debenture, £61,950; first mortgage debenture stock, £204,111; income debenture stock, £187,758; unsecured creditors, £136,725; partly-secured creditors, £808, holding security valued at £525; liability on bills, £2,878; other liabilities, £5,257 in respect of claims under broken contracts and guarantees, of which £5,116 was estimated to rank for dividend; and preferential creditors, £3,560, amount owing for wages and salaries at the date of the receiver's appointment, but probably since paid. The unsecured liabilities included the claims of the short-term noteholders, £65,600, and the claims of trade creditors for goods supplied and services rendered, £71,125 (including the bank for £14,357 for overdraft). The company's failure was attributed by Mr. Leonard Fuller to the endeavours to improve non-profitable departments, which endeavours used up the capital, and prevented the profitable departments being pushed to their full extent. In Mr. Wilson's opinion the failure was due to insufficient capital to develop the programme formed after the reconstruction. Mr. Wade, the chairman, attributed it primarily to the action of the creditor in petitioning for a winding up order. He also stated that the company had made a serious loss over radio equipment, and in the

spring of 1925 it held large stocks which had to be realised at considerably less than cost. Further, a loss of £15,000, made through the Fuller United Electric Company of Canada in the autumn of 1925, seriously embarrassed the company's finance. He (Mr. Wade) was of opinion that the company could have succeeded in overcoming its difficulties had not the application for a winding-up order forced the bank to appoint a receiver. On the other hand, he thought that when the company was reconstructed in 1923 the values of the land, buildings, plant, machinery, &c., were not written down sufficiently, and that the margin of working capital available under the scheme was inadequate. There was not sufficient time to issue a balance sheet for last year. The receiver was appointed before the books were closed; they had to be handed over to him. In reply to a creditor, Mr. Wade said he only knew of one small company for which they acted as agents and in which they invested £120. Replying to other creditors, Mr. Wade said the bank did everything in its power to foster the reconstruction scheme and to protect the interests of the creditors. As late as a fortnight before the appointment of a receiver it advanced £10,000 to the company without security, with a view to getting the scheme through and preserving the interests of the creditors and shareholders. A scheme was put on foot for paying all debts in full, but that was entirely stopped by the action of the petitioning creditor in applying for a winding-up order. A creditor asked whether the directors were interested in Fullers (Ilford), Ltd., which, he understood, was formed just before the liquidation of this company. Mr. L. Fuller said he was a director of the new company, which was registered for the purpose of working certain patents which were the property of the Fuller family. They related to the block accumulator, and this company's interest in them lapsed under the sale agreement in the event of the company's going into liquidation.

The liquidation was left in the hands of the Official Receiver.

COGENT ELECTRICAL CO., LTD., 54, Berry Street, Liverpool.—A meeting of creditors was held on September 9th at the offices of Messrs. Bryce, Hanmer & Co., Liverpool, when a statement of affairs was submitted showing liabilities of £306, all due to unsecured creditors. There were also fully-secured creditors for £7, holding security valued at £10, leaving a surplus of £3. The net assets were £210, leaving a deficiency of £96. The company was formed on March 25th, 1926, with a nominal capital of £500, to take over an existing business. At the time of conversion, the surplus in the business was stated to be £472, and the consideration for the sale of the concern was the issue of 250 fully-paid shares in the company. It was stated, however, that the agreement for sale had never been filed, neither were the shares issued. During the company's trading from March 25th to August 18th the purchases had amounted to £352 and the sales £445, and there was a net loss of £420. It was found impossible to obtain any further capital, and it was therefore resolved to go into voluntary liquidation. The creditors resolved to confirm the voluntary liquidation of the company with Mr. Bryce M. Hanmer as liquidator, while a committee of inspection was nominated, consisting of representatives of the General Electric Co., Ltd., and Rowe Bros. & Co., Ltd., and Mr. Parkin S. Booth. The following are creditors:—

	£		£
General Electric Co., Ltd. ...	77	Smith, T. J., & Son	22
Rowe Bros. & Co., Ltd. ...	35	Miller, G. H.	21
Singlehurst, R. B.	83	Bryce, Hanmer & Co.	25
Cheshire Lines Committee ...	32		

ASSOCIATED ELECTRIC TRADERS, LTD.—Liquidator, Mr. G. D. Pepys, Official Receiver and Liquidator, Carey Street, W.C., released August 27th.

RADIO VALVES, LTD.—Winding up voluntarily. Liquidator, Mr. W. H. Bevan, 182, Temple Chambers, E.C.

ELECTRIC DISTRIBUTING CO., LTD.—A meeting of members is called for October 14th, at 3, York Street, Manchester, to hear an account of the winding up from the liquidator, Mr. H. S. Jones.

BRITISH WIRELESS SUPPLY CO., LTD.—A meeting of members is called for October 7th, at Standard Buildings, City Square, Leeds, to hear an account of the winding up from the liquidator, Mr. C. H. Baker.

Dissolution of Partnership.—NELSON ECONOMIC ELECTRIC CO., electrical engineers and contractors, 6, Bradley Road West, Nelson, Lancs.—Mr. J. M. Hornby and Mr. J. S. Kirkland have dissolved partnership. Mr. Hornby will attend to debts and continue the business alone at the same address.

Private Arrangements.—L. C. HUTTON, trading as "Sports and Radio Stores," 30b, Queen's Parade, New Southgate, N.11.—The creditors interested herein were called together on September 6th at the offices of Messrs. Thorpe & Pearson, accountants, John Street, W.C., when Mr. Pearson submitted a statement of affairs which disclosed liabilities of £613, of which £426 was due to trade creditors; there was a bank overdraft of £17 8s. 10d., while the capital account was scheduled at £169. The assets totalled £613. Mr. Pearson reported that the debtor started business in July, 1925, with a capital of £227. During the year ended July 10th, 1926, the sales were £1,748, and there was a net loss of £69, after charging drawings of Mr. Hutton amounting to £238. Prior to starting in business on his own account, the debtor had been employed as an electrical engineer with various firms. An offer of payment of the debts in full was made, as to 2s. in one month, 3s. in three months, 5s. in six months, 5s. in nine months, and 5s. in 12 months. The creditors decided to accept the offer and that debtor should execute a deed of composition in favour of Mr. Charles Latham, Wireless and Radio Trades Guardian Association, 78, New Oxford Street, W., as trustee, with a committee of inspection. The following are creditors:—

	£		£
British Polyphone Co.	26	British Thomson-Houston Co.,	
Dew, A. J., & Co., Ltd. ...	81	Ltd.	34
Spalding, A. G., & Bros.	26	Wallis, J., Ltd.	22
General Electric Co., Ltd. ...	28	Brown Bros.	39

Registered Electrical Contractors.—The following applications for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its meeting held on September 9th:

Harrison & Searle, Ltd., Birmingham.
Brees, V. R., Macclesfield.
Gunner, H. G., Birmingham.
Smethurst & Co. (London), Ltd., London, W.1
Hodgson & Coley, West Ryton.
Johnson, D., Wallasey.
Holland Beachey & Co., Thame, Oxon.
Wright, A. Blackburn, Donnybrook, Dublin.
Gordon Hughes Electrical Co., Birmingham.
Burgess & Garfield, Birmingham.
Logie, Ashmole & Co., Ltd., Burton-on-Trent.
Jamison, Oswald & N., Belfast.
Finnigan & Pollock, Sunderland.
Lambton & Hobster, Liverpool.
Petts, B., St. Leonards-on-Sea.
Owen & Palmer, Bangor.
Wares, A. J., Ltd., South Shields.
Lilleker Bros., Ltd., Rotherham.

At the same meeting 11 applications were declined and withdrawn.

Turbo-Generator Manufacture in Japan.—The American Consul at Nagasaki reports that the Mitsubishi shipyards in that city have recently undertaken contracts for the manufacture of large electrical plant. A large generator has been constructed for the South Manchurian Railway, and an order has been placed by the Yawata Iron Works for a 20,000-kW steam turbo-generator.

French Customs Tariff.—The *Bulletin* of the British Chamber of Commerce in Paris states that dynamo-electric machines are among the articles exempt from the general increase of 30 per cent. in import duties which has been imposed by the French Customs authorities.

International Iron Convention.—The Berlin correspondent of the *Paris-Midi* states that he learns in well-informed quarters that M. Vandervelde has approached the competent British authorities and the British iron and steel manufacturers with a view to the latter joining the International Iron Convention, the conclusion of which is imminent. It is added that the entry of the British into the Luxemburg Convention is considered to be quite possible, and in any case the formation of an Anglo-American pact, which it is stated was contemplated as a counterbalance to the German-French-Belgian-Luxemburg Convention, is unlikely.—*Reuter* (Paris).

To House Organ Editors.—Many firms in the electrical industry issue house organs for the information of their staff or the interest of their clients. It is suggested that they would render assistance which would be greatly appreciated if they would make some reference in their publications to the "Wiring the Homes of Britain" campaign now being launched by E.D.A. and E.L.M.A. Full particulars will be sent to any person responsible for the production of electrical trade house organs on application to the British Electrical Development Association, 15, Savoy Street, W.C.2.

New French Company. — La Société Independante d'Exploitation Radio-Electrique is the name of a new concern which has lately been formed in Paris with a capital of 1½ million francs, to manufacture radio and electrical apparatus.

Turkish Developments.—It is reported that the concession held by the Société d'Electricité de Constantinople has been prolonged on condition that the capital is increased and the central stations in European Turkey are extended. Only after the extension of these stations will the company be permitted to establish by special cables a connection with the works operated by another company in Asiatic Turkey, in order to be able to furnish an additional supply to the latter. It is proposed to increase the share capital of the company to 56,000,000 Swiss francs.

Book Notices.—"Journal of the Municipal College of Technology, Manchester." Vol. 12, 1926. Manchester: The Education Committee.

"To-day and To-morrow," by Henry Ford, in collaboration with S. Crowther. Pp. 281. London: W. Heinemann, Ltd. Price 12s. 6d. net.

La Radiophone pour Tous, which is in its fourth year of publication in Belgium, will henceforth be published as a wholly French fortnightly magazine by Radio Presse, 15, Boulevard des Italiens, Paris; subscription, 30 fr. a year, plus postage. In the issue for September 5th there is an article on the system of television invented by M. Ed. Belin.

"Stage Lighting."—Reprint of a paper on this subject, with 22 illustrations, read by Mr. H. Lester Groom, A.M.I.E.E., before the Illuminating Engineering Society in March last; issued by the General Electric Co., Ltd., London.

New Argentine Companies.—The following companies have recently been registered in Buenos Aires:—The Compania Internacionale de Telefonos (capital $2,000,000 m/n) to acquire and exploit telephone concessions, &c.; and Electrolux Aparatos Electricos (capital $200,000 m/n) to import, export, manufacture and sell electric cleaners, and to carry on general electrical business.

The E.D.A.-E.L.M.A. Campaign.—We have received from the British Electrical Development Association a print of the first of the national advertisements appearing in connection with the "Wiring the Homes of Britain" campaign. It announces the ballot, and the prize house is depicted with the word "Free" given great prominence. A coupon forms part of the advertisement, and the reader is asked to fill it up and hand it in at an electric shop or electricity supply showroom to obtain the competition booklet. In connection with the campaign, a conference of sales representatives of electricity undertakings in the area of the West Riding (Aire and Calder) Electricity District was held on September 10th at the headquarters of the Bradford Corporation Electricity Department. Mr. C. E. Allsopp, sales manager of the Bradford undertaking, presided. Mr. H. Girdlestone, district officer for the North-Midland area, outlined the scheme.

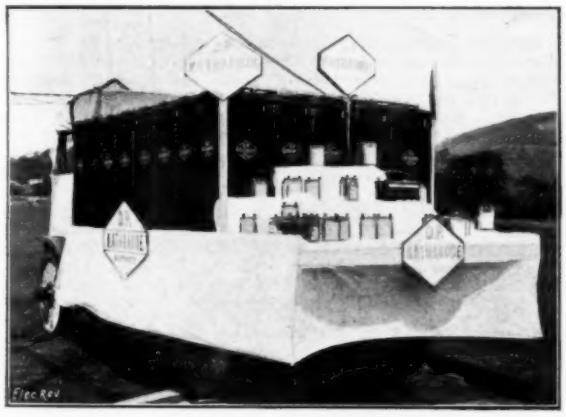
Copper, Lead, and Rubber Prices.—Messrs. F. Smith and Co. report, September 14th:—Copper (electrolytic) bars, £67, 5s. dec.; ditto ditto sheets, no change; ditto ditto wire rods, £77, 5s. dec.; ditto ditto h.c. wire, 9¼d., 1/16d. dec.

Messrs. James & Shakespeare report, September 14th:—Copper bars (best selected), sheet and rod, no change; English pig lead, £33 5s., 10s. dec.

Messrs. Edward Till & Co. report, September 14th:—India rubber, Para fine, 1s. 7¼d., ¼d. dec.

The Resources of Colombia.—We have received from the Colombian Government Bureau of Information and Trade Development a copy of a memorandum prepared for the assistance of the International Economic Conference by Dr. Esteban Jaramillo, a Colombian economist and a former Minister of State. This deals in a broad manner with the immense resources—mineral and agricultural—of Colombia; the Republic's finances and fiscal policy; and industry. It is stated that the revision of the tariff is under consideration to clear up a number of ambiguities, &c. In this connection it is interesting to note that all changes in tariffs are made gradually over a period as a safeguard against loss to traders which sudden changes often involve.

A Mobile Battery Station.—The illustration herewith shows a mobile "power station" which was employed at a fair in connection with a recent Bakewell carnival in aid of the local hospitals. The vehicle was an electric lorry belonging to the D.P. Battery Co., Ltd., and upon it were mounted



A Mobile Battery Station.

two separate batteries of large "D.P." accumulators, one supplying a 100-V circuit and the other a 50-V circuit for lighting the fair ground. The results were very satisfactory, a steady light being maintained until the fair closed at midnight.

Golf Match.—A mixed foursome competition arranged by the Automatic Telephone Manufacturing Co. Golf Club at Bowring Municipal Course, resulted in Mrs. Passmore and Mr. J. Williams making a net score of 76½ (combined handicap 31½) winning a handsome silver trophy for the lady. Mrs. Holland and Mr. R. E. Boyd were runners-up with a net score of 77 (combined handicap 26). There were eleven foursomes in all and other scores followed very closely, keen competition being displayed.

Developments in the Belgian Congo. — Mr. J. P. MacGregor, British Consul at Boma, has forwarded to the Department of Overseas Trade a report upon the economic situation in the Belgian Congo (Stationery Office, 1s. 6d. net). This deals largely with the mineral resources of the country and shows that production continues to grow. The exports of copper (metal) rose from 55,327,981 kg. in 1923 to 85,670,377 in 1924. In the first nine months of 1925 the exports amounted to 67,334,000 kg. The exports of tin increased from 1,436,615 kg. in 1923 to 2,137,196 kg. in 1924. Large extensions are being made in the copper-producing plant of the Union Minière du Haut Katanga, which aims at an annual output of 200,000 tons. The capacity of the power plant is being trebled by the addition of two 10,000-kW sets. In 1925 the company's electrical plant at Panda turned out 750 tons of copper-cobalt alloy. The company controls the world's market in cobalt and radium. As opposed to the mineral exports, the shipments of rubber and gum copal are steadily falling off. Among the newer companies in the Congo is the Société Coloniale d'Electricité, Elisabethville. This company had an initial capital of 3,000,000 fr., but this was recently doubled. In 1925 the Société Générale des Fours Hydro-Electriques du Katanga ("Sogefor"), was formed at Elisabethville. It has a capital of 75,000,000 fr., and its objects are apparent from its title. The importation of electrical machinery and apparatus has shown a rapid expansion. The totals are as follows:—1922, 174,162 kg.; 1923, 334,465 kg.; 1924, 617,206 kg.; 1925 (six months), 425,258 kg. The United Kingdom's share in the last three complete years was 12,828 kg., 5,552 kg., and 27,389 kg. respectively. Mr. MacGregor says that so far as British trade with the Belgian Congo is concerned, there is no reason to be disappointed with our share of the total under present conditions of development. The market will, however, repay careful watching, so that opportunities for fresh enterprise may not be missed. Such opportunities will immediately present themselves when the very difficult problem of opening up an effective transport system from the sea to the upper river is finally solved, and the development of one of the richest areas of the world will be thus greatly accelerated.

Commercial Electrical Travellers.—The Electrical Trades Commercial Travellers' Association commences its Winter Season 1926-27 with a general meeting to-night at St. Bride's Institute, the Association headquarters. Other events in the season's programme are as follows:—October 15th, Bohemian concert; the annual general meeting on November 19th; December 3rd, a carnival dance; January 21st, 1927, a general meeting; February 11th, annual dinner at the Holborn Restaurant; March 18th, grand carnival dance; and two general meetings on March 25th and May 27th. As stated in our last issue, Sir Hugo Hirst, Bart., has accepted the presidency of the Association for the forthcoming year. Mr. E. A. Joyce continues as chairman, and Mr. R. F. Norris, of 25, Hamlet Gardens, Ravenscourt Park, W.6, is the honorary secretary.

Swedish Commercial Secretary's Address.—The address of Mr. H. Kershaw, O.B.E., who has recently been appointed Commercial Secretary for Denmark as well as Sweden, is now: Hovslagaregatan 5b, Stockholm.

Unemployment.—There was a further decrease in the number of unemployed persons during the week ended August 30th. At that date the total was 1,549,800, as compared with 1,558,938 on August 23rd, and 1,354,302 on August 31st, 1925.

N.S.W. Government Preference.—As a result of the representations made by recent deputations, the Premier of New South Wales has approved of the following preferences being given to Australian manufactures by all Government departments:—Twenty per cent. against Empire goods which are admitted free of duty; 15 per cent. against Empire goods which are subject to 5 per cent. duty; 10 per cent. against Empire goods which are subject to 10 per cent. duty or more, and an additional 10 per cent. preference against foreign goods.

Lighting and Power Notes.

Bradford.—STREET LIGHTING.—In connection with the Corporation's decision to light the tramway and railless-car routes by electricity, application has been made for sanction to a loan of £22,500 to cover the cost of the scheme. Approximately 50 miles of road will be affected.

ELECTRICITY SUPPLY.—On September 3rd, the Electricity Committee approved the installation of electricity in 91 new houses, 57 existing shops, and other premises, involving the laying of four miles of mains.

Bromley (Kent).—PURCHASE OF UNDERTAKING.—The Town Council has decided to give the Bromley (Kent) Electric Light and Power Co., Ltd., notice of its intention to purchase the electricity undertaking.

Canada.—TORONTO.—The fifteenth annual report upon the Toronto hydro-electric system, covering the year 1925, shows a total revenue of $8,827,373, as compared with $8,476,672 in the preceding year. Working expenses amounted to $6,305,984, as against $6,211,092, leaving a gross surplus of $2,521,388 ($2,265,579). Interest, depreciation, taxes, sinking fund, &c., contributions absorbed $2,374,005, resulting in a net surplus of $81,382 ($51,923), which was carried to reserve for stabilisation of rates, as in previous years. The electrical energy sold increased from 485,708,476 to 512,784,492 kWh. The connected load rose from 542,074 to 584,182 h.p., and the maximum supply demanded from 191,803 to 194,512 h.p. Additional plant installed at the various sub-stations included one 5,000-kW and eighteen 1,000-kW transformers, one 5,000-kW condenser, and one 1,000-kW rotary converter. Approximately 61,000 ft. of underground cable was laid during the year.

Clayton (Yorks.).—ELECTRICITY SUPPLY.—At a recent meeting of the Urban District Council, the Clerk reported on consultations with the Yorkshire Electric Power Company and the Bradford Corporation Electricity Department, with regard to a suggestion that those authorities should mutually agree to withdraw their rival applications to supply electricity to Clayton, leaving the Council itself as the sole applicant. Bradford Corporation had signified willingness, but the company had not yet communicated its decision on the matter. It was decided that the company should be communicated with again, asking it to withdraw its application.

Colchester.—ELECTRICITY SUPPLY.—The Corporation Electricity Supply Committee has entered into an agreement with the Britannia Lathe and Oil Engine Co., Ltd. (Colchester), to

take from the company a supply of electricity during the winter.

ADDITIONAL BOILER PLANT.—The committee has authorised the purchase of a second-hand boiler for the Osborne Street station for the purpose of augmenting the supply during the winter.

Continental.—SPAIN.—Last year the plant at the power stations of the Sociedad Hidroelectrica Espanola was increased by the addition of six 6,250-kVA single-phase 132,000/66,000/6,000-V transformers, bringing the total transformer capacity up to 37,500 kVA. A new transmission line has been completed between Olmedilla (Cuenca province) and Madrid, a distance of about 100 miles, and it is hoped to increase the pressure on the line this year to 132,000 V, to supply Madrid with an additional 24,000 kW. At the Olmedilla transformer station three new 10,000-kVA, 66,000/132,000-V single-phase transformers are being installed to receive electricity from the Villora and Molinai stations for transmission to Madrid. The new work which is about to be taken in hand includes a hydro-electric station to utilise the second portion of the Dos Aguas falls. This station will have an output of 250 million kWh per year.

FRANCE.—The Compagnie Générale d'Industrie, of Paris, has received authority to proceed with the establishment of a 60,000-V transmission line between Carmaux and Lentin, in the Department of Tarn.

Elland.—LOAN.—The Finance Committee has consented to an application being made to the Electricity Commissioners for sanction to borrow £2,000 for mains.

Guernsey.—NEW PLANT.—A new 3,000-kW steam turbo-generator is being added to the power station of the Guernsey Electric Light and Power Co., Ltd.

Haslingden.—ELECTRICITY IN SMALL HOUSES.—The Corporation Building Committee has decided to install "Kaybee" electric wash boilers in 68 houses in course of erection on the Clarence Housing Estate. This is the fourth housing estate in which electricity only has been installed.

Hastings.—NEW SUB-STATION.—The Electricity Committee has prepared a scheme for a new sub-station, &c., at a cost of £12,000.

Irish Free State.—LIMERICK.—As a result of a conference that took place recently between the Limerick Harbour Board and the Corporation, an agreement has been come to on the question of the height of the steel standards that are to carry the cables from the Ardnacrusha power station to Limerick station. It was agreed that the height of the standards at the lie-by, Sarsfield Bridge, should be 100 ft., so as not to interfere with navigation at that point, and 60 ft. along the quay to the power station.

King's Lynn.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. C. W. Jackson) for the year ended March 31st last show a total revenue of £19,366, as compared with £18,725 in the preceding year. Working expenses amounted to £11,045, as against £10,454, leaving a gross profit of £8,320 (£8,271). After providing for capital charges, there was a net surplus of £3,105, as compared with £3,623 in 1924-25. The capital expenditure during the year amounted to £27,857, and included £15,670 for machinery and £11,420 for mains, services and street lamps. The electrical energy sold increased from 1,504,665 to 1,535,926 kWh, and the average price obtained per kWh fell from 2.89d. to 2.82d.

London.—SHOREDITCH.—The borough electrical engineer has informed the Housing Committee that applications have been received from residents of the Provost dwellings for electric cookers, and that the Lighting Committee is prepared to install cookers and kettles at an inclusive charge for hire and maintenance of 1½d. per kWh, providing the Housing Committee will bear the cost of wiring, estimated at £2 15s. per flat. The Housing Committee has accepted the offer of the Electricity Committee.

Newhaven.—OPPOSITION TO ORDER.—The Rural District Council has decided not to approve of an application by the Peacehaven Electric Light and Power Co., Ltd., for a Special Order to establish a generating station in the district. Ratepayers at Telscombe asked the Council to oppose the application on the ground that the Brighton Corporation had been applied to for a supply of electricity.

Newport (Mon.).—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. A. Nichols Moore) for the year ended March 31st last shows a total income of £175,381, and working expenditure of £101,848, leaving a gross profit of £73,533. The figures for the preceding year were: Income, £151,528; working expenses, £92,560; gross profit, £58,968. To the gross profit was added a balance from the previous year of £8,568, and revenue from other sources of £717, making a total of £82,819. Capital charges, &c., absorbed £56,519, leaving a net surplus of £26,300, of which £7,260 was contributed to the borough fund and the remainder carried forward. The capital expenditure during the year amounted to £120,361, and included £50,942 for machinery and £33,825 for mains. The sales of electrical energy increased from 18,899,291 to 24,547,151 kWh, and the maximum supply demanded from 9,638 to 11,030 kW. The average price obtained per kWh fell from 1.762d. to 1.564d. Work on the installation of a 10,000-kW turbo-alternator, complete with condensing plant, is in progress, and it is expected that the new set will be in operation during the present year.

LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £30,000 for wiring installations.

Northern Ireland.—LURGAN.—At a recent meeting of the Urban District Council it was reported that good progress was being made with the electricity scheme for the district, and that it would probably be completed by October.

Peterborough.—LOANS.—The Town Council is applying for sanction to loans of £37,360, being the balance of expenditure in connection with the extension of the electricity works, and £2,224 for the conversion of 183 gas lamps to electricity.

Price Increases.—Owing to the higher cost of coal, increases in the charges have been made or recommended in the following districts:—

DEWSBURY.—Lighting: An increase of ¼d. per kWh. Power and heating: An increase of ¾d. per kWh. Rateable value and restricted hours system: 15 per cent.

DARWEN.—A general increase of 10 per cent.

WIGAN.—Lighting, heating and power: An increase of 10 per cent.

Sleaford.—PRICE REDUCTIONS.—The Urban District Council has made the following reductions in the charges for electricity:—Lighting: 1,000 to 2,500 kWh per annum, 5 per cent.; 2,500 to 5,000 kWh, 10 per cent.; beyond, 20 per cent. Power, 5,000 to 10,000 kWh, 5 per cent.; 10,000 to 15,000 kWh, 10 per cent.; 15,000 to 20,000 kWh, 15 per cent.; beyond, 20 per cent.

Southport.—ELECTRICITY IN BULK.—The *Southport Visiter* reports that at a recent meeting of the Corporation Electricity Committee, the Town Clerk reported that he had completed the agreement with the Birkdale Electric Supply Co., Ltd., providing for the new terms of bulk supply by the Corporation to the company. The agreement contained a provision that the company would, during the continuance of the agreement, take from the Corporation all electricity necessary for the company's requirements in excess of that produced by its present plant and would not during that period make any extension to its own generating station. It was also reported that the company had applied for the Corporation's consent to change its system of supply from d.c. to a.c. 50 cycles, three-phase, and that consent had been granted, subject to certain provisions. It was resolved that the reports be adopted, and the action of the town clerk approved.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities: The Leicestershire and Warwickshire Electric Power Co., for the supply of electricity in certain parishes in the rural districts of Ashby-de-la-Zouch, Barrow-upon-Soar, Blaby, Loughborough, Market Bosworth, and Tamworth; the Minehead Electric Supply Co., Ltd., to supply in the urban district of Watchet and in certain parishes in the rural district of Williton.

The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Porthcawl Urban District Council to supply in the urban district, and the Horley and District Electricity Supply Co., Ltd., to supply in parts of the rural districts of Reigate and East Grinstead.

Stretford.—LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £34,500 for electricity extensions.

Tamworth.—SPECIAL ORDER.—The Rural District Council has consented to the application of the Pooley Hall Colliery Co., Ltd., for a Special Order to supply electricity within the rural district.

Tramway and Railway Notes.

Aberdeen.—YEAR'S WORKING.—We have received from Mr. W. Forbes, general manager of the City tramway undertaking, a copy of his report, together with the statement of accounts for the year ended May 31st last. The total revenue amounted to £177,568, as compared with £189,247 in the preceding year, and the working expenditure was £142,692, as against £150,691, leaving a gross surplus of £34,876 (£38,556). After payment of capital charges, &c., there was a net profit of £759, as compared with £438 in 1924-25. The capital expenditure during the year amounted to £77,359, the chief items being £23,750 for buildings, and £25,993 for cars. The number of passengers carried decreased from 43,201,580 to 40,471,662, the falling off being attributed to motor omnibus competition experienced all over the system. The car miles run increased from 2,675,785 to 2,792,572.

Australia.—MELBOURNE.—According to the *Electrical Engineer of Australia and New Zealand*, authority has been given the Melbourne Tramway Board to raise two loans, one of £100,000 and one of £119,140. Plans have been completed for the conversion of the Prahran and Toorak cable tramway to electric traction and the extension of the line along Toorak road to Glenferrie road. The Board is considering running railless cars on the Orrong road route, through Caulfield to Brighton, which was recently abandoned by a private motor 'bus company.

Brazil.—RAILWAY ELECTRIFICATION.—According to *Commerce Reports*, plans have been made for the electrification of about 98 miles of railway from Sao Paulo to Santo Antonio on the Sorocabana Railway. It is reported that 50 electric locomotives will be required for this section.

Continental.—CZECHO-SLOVAKIA.—According to the *Gazette de Prague*, rapid progress is being made with the electrification of the Czecho-Slovak railways. The first part of the work consists of the electrification of the sidings and the second that of the traffic lines. A 2,200-kW, d.c., 22,000-V converter is at present being constructed, as well as one of 1,100 kW. The question of supplying the necessary energy has been settled, and it has been decided that until the large hydro-electric power stations have been completed on the Elbe and at Stechovice, the current shall be obtained from the Ervenice station. When the construction of all the hydro-electric power stations contemplated has been carried out the electrification of the Prague suburban railway system will be actively proceeded with.—*Reuter's Trade Service* (Prague).

BELGIUM.—The Société Nationale des Chemins de Fer has received authority to proceed with the extension of the electric railway between Schooten (Petite Barriere) and Hoogboon to Putte on the Dutch frontier.

SWEDEN.—It is stated that the working results of the Stockholm-Gothenborg Railway, which was converted to electric traction four months ago, have exceeded all expectations. For the moment consideration is not being given to the question of extending the work of electrification to other main lines, as it is first desired to ascertain the definite economic results from the line mentioned.

Crewe.—RAILLESS CARS.—At a recent meeting of the Town Council a resolution was carried referring the consideration of railless cars to a sub-committee.

Newport (Mon.).—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager, Mr. N. J. Young) for the year ended March 31st last, record a total revenue of £111,917, as compared with £109,488 in the previous year. Working expenses amounted to £82,251, as against £78,840, leaving a gross profit of £29,666 (£30,648), to which was added revenue from other sources, making a total of £30,929. After meeting capital charges and permanent way renewals charged to revenue, there was a net surplus of £2,956, against which, however, was charged a deficit of £2,860 brought forward from the previous year, leaving a credit balance of £95. The number of passengers carried increased from 16,440,299 to 17,262,187, the car miles run from 1,262,498 to 1,285,707, and the average total revenue per car mile from 20.813d. to 20.891d.

St. Helens.—TRACK RENEWALS.—The Corporation has received the sanction of the Minister of Transport to a loan of £11,400 for track renewals.

United States.—DETROIT.—According to the *Electric Railway Journal*, an initial rapid transit system proposed for the city of Detroit and adjacent municipalities costing $187,789,000 and involving a total of 46.6 miles, is recommended by the Rapid Transit Commission in its report recently submitted to the City Council. The plan calls for four lines, covering routes in directions north, south, east and west. Of the 46.6 miles of route proposed, 42.7 will be in Detroit, and of the total construction cost, $172,001,000 is to be borne by the Council. The four routes include: Vernon Highway Crosstown line 11.2 miles long, which it is planned to build as the first section; the Woodward-Fort North and South line, 7.5 miles long; the Salina-McGraw-Grand Boulevard-St. Jean-Crosstown line, 14.3 miles long; and the Grand River-Jefferson-Mount Elliott-Gratiot-West Side and East Side line, 13.6 miles long. The routes will be submitted to the residents at the November election and if the plans are approved the last step essential to the rapid transit system will have been completed. Among the conclusions set forth by the Commission are that the initial system should be constructed as a two-track subway system, and that the work of construction should be completed in 13 years from the year of commencement. After studying the Commission's recommendations the City Council unanimously carried a motion that the ordinance be placed on order of first and second reading, and a date for a public hearing on the report will be fixed in the near future.

Telegraph and Telephone Notes.

Belgium.—TELEPHONE AND TELEGRAPH SYSTEMS.—The Belgian Government is engaged in the preparation of a Bill for presentation to Parliament in October, providing for the transference of the State telephone and telegraph system to a company in a manner similar to the so-called "industrialisation" of the State railways. The capital of the company is to be 1,800,000,000 fr., of which 1,500 millions would be in the form of preference shares and be offered to the public, while the balance of 300 millions would be ordinary shares with multiple voting rights and be held by the State. It is stated that the scheme is proposed in connection with the stabilisation of the Belgian currency, and that it is intended to provide further funds for the Treasury or the sinking fund. It is reported that the Belgian Government is in negotiation with German firms with a view to securing deliveries on reparation account for the development of the telephone and telegraph system.

Belgian Congo.—RADIO-TELEPHONY.—M. Robert Goldschmidt has recently succeeded in establishing direct wireless telephony between Machelen, Belgium, and Stanleyville and Elizabethville, in the Belgian Congo, a distance of nearly 4,700 miles. M. Goldschmidt has offered to install a wireless telephony set in the offices of the Ministry of the Colonies in Brussels to enable it to carry on official communication with the Belgian Congo.

Brazil.—TELEPHONE CONSTRUCTION.—A contract has been signed by the Ministry of Transportation and the Companía Rio Grandense for the extension of the telephone lines to the borders of the neighbouring States of Argentina and Uruguay. Many telephone stations are being converted to automatic operation.—*Reuter's Trade Service* (Rio de Janeiro).

Channel Islands.—WIRELESS GUIDE FOR SHIPS.—A message from Cherbourg states that the new radio-electric post which has been erected at the Casquets for the purpose of guiding ships at a distance was put into operation recently. The new system enabled the *President Harding* to manœuvre without difficulty in a thick fog.—*Reuter* (Paris).

Dewsbury.—POLICE TELEPHONES.—The Corporation has approved the establishment of the police telephone-box system in the town, the telephones to be available not only for the police but also for the public in case of fire, accident or other emergency. Twelve boxes are to be set up at a cost of £240.

Egypt.—NEW CABLE.—The Egyptian Government has voted a sum of £52,000 towards the cost of linking-up Cairo and Alexandria by means of an underground telephone cable: the total expenditure of £250,000 will be spread over a period of several years.

Iceland.—EXTENSION OF CONCESSION.—According to the *Telegraph and Telephone Age*, the concession of the Great Northern Telegraph Co., Ltd., in respect of the Iceland cable, expires this year. Negotiations between the Danish and Icelandic Governments and the company have, however, resulted in an agreement granting the company a prolongation of its concession until the end of 1934, unless previously terminated by notice by either party. The agreement, which has been approved by the Parliament of Iceland, has only been secured by the company's making considerable sacrifices on various points, the total telegraph traffic exchanged with Iceland not being sufficiently large to make both cable and radio services remunerative. Under the new agreement the whole of the telegraph correspondence of Iceland, with the exception of news messages and meteorological telegrams, is retained for the cable route. In return, the company has agreed to make considerable tariff reductions, and to hand over the working of its telegraph station at Seydisfjord to the Icelandic Telegraph Administration.

Latin-American Wireless Combine.—The Governments of Mexico and Cuba have entered into a reciprocal arrangement for the connection of their respective telegraph systems by wireless and the institution of a transmission service for public and private purposes. All messages must be transmitted in Spanish, no use of code being permissible. The revenues derived from the services are to be divided equally between the two States, and accounts are to be kept in United States currency.—*Reuter's Trade Service* (Mexico City).

Northern Ireland.—TELEPHONE SYSTEM EXTENSION.—A new rural party line telephone system is now in course of construction between Omagh and Mountjoy, being one of the first systems of the kind in the North of Ireland. The towns of Fintona, Dromore, and Seakinore are also being connected by telephone.

South Africa.—NEW TELEPHONE SYSTEM.—*Commerce Reports* states that the Union of South Africa plans to install a new system of trunk-line telephones by which Durban will be connected with Cape Town. The system will also be used for relaying Cape Town broadcasting.

Twickenham.—NEW EXCHANGE.—The *Financial Times* reports that the new Popesgrove telephone exchange for Twickenham was opened on September 11th. It has a capacity of 1,300 lines.

United States.—A TWO-VOLUME DIRECTORY.—With some 1,500,000 telephones—three times as many as London—New York City has had to publish its new telephone directory in two volumes; one, of which 1,570,000 copies were issued, contains the names of subscribers in Manhattan and the Bronx; the other, of which the issue was 420,000 copies, lists those in Brooklyn and Queens. Each volume gives the numbers of some 35,000 new telephone users—an increase of 70,000 in all during the last six months.

West Indies.—AUTOMATIC TELEPHONES.—The Government of the Republic of Santo Domingo, situated on the Island of Haiti, in the West Indies, has formulated plans to equip the telephone system with an automatic exchange.

Wireless Transmission in the Air.—An experimental journey between Paris and Rabat is to be made by Lieutenants Gerardot and Cornillon, for the purpose of registering observations with regard to the manner in which wireless can be used aboard an ordinary aeroplane, over a long distance. The wave-length used by the aeroplane's transmitter will be 650 metres, and throughout the flight the two men will remain in constant touch with the wireless stations of Orly, Bordeaux, Toulouse, Algiers, and Casablanca.—*Reuter* (Paris).

Radio Notes.

Jugo-Slavia.—NEW STATION.—The new broadcasting station at Zagreb is operating successfully; its power is 0.5 kW and the wave-length used is 350 metres.

Poland.—RECONSTRUCTION OF BROADCASTING STATION.—The *Gazette de Prague* states that since the equipment of the broadcasting station at Poznan does not correspond with the progress that has been made in the wireless telephonic industry, the Polish Government has decided to reconstruct this station on the most modern lines.—*Reuter's Trade Service* (Prague).

Sweden.—LICENCES.—The *Financial News* reports that the radio licences in Sweden now total 207,558, which represents a little more than 34 licences per 1,000 inhabitants.

Wavelengths.—According to the daily Press, the rearrangement of European wavelengths, which was to have been put into operation on September 15th, has been postponed until October 15th. An announcement has been issued from Geneva stating that more time is required to carry out the necessary alterations. The British Broadcasting Co. states that all broadcasting stations will be equipped with an electrical indicator of special design, and whenever a station departs from the specified wavelength, a warning will be given by means of a luminous dial.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—October 20th. Victorian Government Railways. Rail motor equipment. (A.X. 3449.)*
October 5th. Postmaster-General's Department. Switchboard cords. (B.X. 2747.)*
October 12th. Automatic exchange equipment.
October 26th. Telephone plugs and sleeves. (B.X. 2799.)*
November 9th. Telephone transformers. (B.X. 2797.)* Telephone protective apparatus. (B.X. 2840.)*
SYDNEY.—October 18th. Municipal Council. Two 100-ton electrical overhead travelling cranes. (A.X. 3467.)*
November 1st. Boiler feed pumps for Bunnerong power station. (A.X. 3470.)*
September 20th. 33,000-V insulators. (Spec. 1,048.)
November 15th. 33,000-V cable and pilot cable. (Spec. 1,047.) Specifications from Constructional Engineer, Electricity Department, Town Hall, Sydney.

Birkenhead.—September 24th. Mersey Railway Co. Electrical sundries, &c., including carbon-filament lamps and fittings. Form of tender from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

Brighton.—September 21st. Board of Guardians. Electrical fittings, &c. Forms of tender from Mr. H. Burfield, clerk to the Guardians, Poor Law Offices, Brighton.

Croydon.—September 23rd. Board of Guardians. Six months' supply of electrical fittings and appliances. Forms of tender from Mr. H. P. Walker, clerk to the Guardians, Mayday Road, Thornton Heath.

Dublin.—October 18th. Electricity Supply Department. Four water-tube boilers, stokers, economisers, feed pumps and accessories, necessary buildings, foundations, &c. (September 10th.)
5,000-kW generating set complete. (See this issue.)

Edinburgh.—October 18th. Electricity Supply Department. Two motor-driven circulating-water pumps, drainage pump, valves and pipework. (See this issue.)

Egypt.—CAIRO.—January 1st. Director-General, Mechanical Department, P.W.M. Supply and erection at the site of the Seru pumping and power station of four internal-combustion Diesel alternator groups, three pumps and accessories. Chief Inspecting Engineer in London, Queen Anne's Chambers, Broadway, Westminster, S.W.1. Supply of telegraph and telephone materials, at a cost of between £E.26,000 and £E28,000.—*Reuter's Trade Service* (Cairo).

Halifax.—September 21st. Board of Guardians. Electrical fittings for six months. Mr. Arthur T. Longbotham, clerk, Carlton Street.

Hull.—October 5th. Electricity Department. One 20-ton electrical overhead travelling crane. (See this issue.)

India.—October 1st. India Store Department. Two 125-kVA, 3,300-V crude-oil engine alternator sets, with water-cooling plant, switchboard, transformers, &c., for Cauvery Metur project. (September 10th.)

Manchester.—October 8th. Electricity Department. Two 25,000-kVA and one 1,250-kVA, 3-phase transformers and one 100-ton electrically-operated crane. (September 10th.)

Newport (Mon.).—September 25th. Electricity Department. Motor converter and switchgear. (September 10th.)

New Zealand.—CHRISTCHURCH.—October 19th. Christchurch Drainage Board. Three sets of electric centrifugal pumping plant. (A.X. 3215.)*
WELLINGTON.—September 28th. Public Works Department. Three electrically-driven low-lift pumps, with control apparatus, for the Taleri drainage. (A.X. 3274.)*
November 2nd. Electric generators and turbines. (B.X. 2622); indoor control gear and switchgear. (B.X. 2675.); 110,000-V transformer for Waikaremoana power scheme. (B.X. 2744.)*
October 5th. One four-motor overhead travelling crane and runway. (A.X. 3517.)*
November 23rd. Lightning arresters and transformers. (B.X. 2792.)*
December 10th. Government Railways. Electric motors. (B.X. 2861.)*
November 8th. Post and Telegraph Department. Diaphragms, cords, &c. (B.X. 2860.)
NEW PLYMOUTH.—October 16th. Harbour Board. One 30-cwt. portal electric jib crane, &c. (A.X. 3458.)
AUCKLAND.—October 4th. Electric Power Board. Pole oil switches. (B.X. 2795.)*
October 11th. Ironclad switchgear and single-phase transformers. (B.X. 2793.)*
September 28th. 22,000-V, 3-core armoured cable, pilot cable, joint boxes and dividing boxes. (September 10th.)
INVERCARGILL.—December 1st. Southland Electric Power Board. One 3,200-h.p. horizontal Francis turbine and one 2,350-kW generator. (B.X. 2822.)*

Portsmouth. — October 1st. Tramways Department. Stores for 12 months, including insulating materials, lamps, overhead line materials, &c. (September 10th.)

Pudsey.—October 5th. Electricity Department. L.p. cables (approx. 4 miles), joint boxes, feeder pillars, &c. (See this issue.)

South Africa.—JOHANNESBURG.—September 23rd. Town Council. Switchboard-type overload relays. (B.X. 2809.)*
PRETORIA.—October 7th. Municipal Council. Transformer and switchgear for the abattoir sub-station. (B.X. 2851.)*

Uruguay.—MONTEVIDEO.—State Electricity Supply Works. Diesel electric generating sets. (B.X. 2865.)*

Warrington.—September 21st. Board of Guardians. Electrical supplies for six months. Mr. Arthur Bottomley, clerk, Museum Street.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—SYDNEY.—City Council. Accepted :—
Bare copper cable (£1,195).—W. Adams & Co., Ltd
Submarine cable and pilots, Dawes Point to McMahons Point (spec. 1,002) (amended tender, £17,893).—Siemens (Aust.) Pty., Ltd.
L.p. underground cables (spec. 1,030) (£28,680).—Enfield Cable Works (Aust.), Ltd.
Induction voltage regulators (£31,906, including £956 for spare parts).—Siemens (Aust.) Pty., Ltd.
—*Tenders.*

For the supply of gasfilled lamps (spec. 1,003) 11 tenders were received, the lowest, at £3,939, being for lamps manufactured by the Compagnie des Lampes, of Lyons, from H. Vale and Co.,; the remaining offers were all at the same price—£4,581. According to the *Sydney Morning Herald*, on the cabled advice of Mr. Forbes Mackay, the Committee recommend acceptance of the tender of Messrs. Noyes Bros. (Sydney), Ltd., for British lamps manufactured by Phillips Glow Lamps, Ltd., as the most suitable. After considerable discussion, the Council rejected the recommendation, and decided to give the entire contract to Messrs. F. A. Segur and Co., Ltd., for lamps made by the Condor Lamp Co., of Holland, the price being the same as that quoted for the British lamps. A notice of motion to rescind the resolution has been tabled.

MELBOURNE.—City Council. Accepted :—
5,500-kW turbo-alternator (£27,448).—English Electric Co. of Aust., Ltd.

Belgium.—Belgian, British (Callender's Cable and Construction Co., Ltd.), and German concerns competed for the recent contract for the supply of 5 kilometres of l.p. armoured cable to the municipal authorities of Schaerbeek. The lowest offer was that of a Belgian concern.

Dover.—Town Council. Accepted:—
E.h.p. voltage regulator (£1,013).—British Electric Transformer Co., Ltd.

Dublin.—City Commissioners. Accepted:—
Electrical wiring of houses, Croydon Park housing scheme (sections 3 and 6) (£2,395) (25s. 6d. per light with Continental wire).—Dublin City Electricity Department.

Glasgow.—Finance Committee. Accepted:—
Telephone installation at Kelvin Hall (£414); electrical installation at Kelvin Hall (£6,760).—Edmiston, Brown & Co., Ltd.

Tramways Committee. Recommended :—
Trolley wire.—Thomas Purdon & Sons.
500 steel tires.—J. Baker & Co.

Housing Committee. Recommended :—
Electrical installation at Summerton Road housing estate (£1,288); at Balornock estate (£991).—R. J. M'Intyre.

Corporation. Accepted :—
Installing automatic fire alarms in Kelvin Hall (£1,680).—Associated Fire Alarms, Ltd.

With reference to the decision of the Corporation to accept the tender of the Whitecross Co., Ltd., for the supply of trolley wire, the tramway manager reported that before acceptance the firm had increased the price, and that he had accepted the offer of Messrs. Thomas Purdon & Sons, the second lowest British offer.

Horsham.—Board of Guardians. Accepted:—
Electrical installation at infirmary (£273).—H. Saunders & Sons.

Lamp Contracts.—The Southern Railway has placed a six-months' contract for the supply of "Osram" metal-filament, vacuum, and gasfilled lamps and Robertson carbon-filament lamps with the General Electric Co., Ltd.; and Messrs. Geo. Thompson & Co., Ltd. (Aberdeen Line) has placed contracts for electric incandescent lamps with Siemens and English Electric Lamp Co., Ltd., and the British Thomson-Houston Co., Ltd.

London.—HACKNEY.—North Metropolitan Electric Power Supply Co., Ltd. Accepted:—
1,000-kW transformer, for Hackney linking-up scheme (£553).—British Electric Transformer Co., Ltd.

Newport (Mon.).—Electricity Committee. Accepted:—
New plates, &c., for reconditioning battery (£5,601).—Tudor Accumulator Co., Ltd.

Stretford.—Electricity Committee. Accepted:—
Alteration to switchgear at sub-station (£210).—Metropolitan-Vickers Electrical Co., Ltd.

Waterford.—Corporation. Accepted:—
Overhead mains in connection with the electric lighting scheme (£12,488).—Siemens Schuckert (Ireland), Ltd.

West Hartlepool.—Tramways Department. Accepted:—
12 "Garrett" low-loading trolley 'buses, including overhead equipment (approx. £25,000).—Richd. Garrett & Sons, Ltd.

York.—Electricity Committee. Accepted:—
Laying circulating water pipes across Foss Islands Road (£583).—Parker and Sharp, Ltd.

Forthcoming Events.

Electrical Trades Commercial Travellers' Association.—Friday, September 17th. At St. Bride's Institute, E.C. At 7 p.m. General meeting.

"Model Engineer" Exhibition.—September 17th-25th. At the Royal Horticultural Hall, Westminster, S.W.

Salford Technical and Engineering Association.—Saturday, September 18th. At the Royal Technical College. At 7 p.m. Lecture on "Modern Developments in Structural Engineering," by Mr. A. S. Spencer.

Institution of Electrical Engineers (South-Midland Students' Section).—Saturday, September 18th. Visit to the Stourport super-power station.

Meter Engineers' Technical Association.—Thursday, September 23rd. At the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, W.C. At 7 p.m. Presidential address by Mr. G. F. Shotter.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

PERFAR vacuum cleaners.

A reader has written in regard to makers of Violet Ray apparatus, but has not enclosed his address. We should be glad to hear from him again.

Notes.

Smoke Abatement Competition in France.—At the instance of the authorities of the Department of the Seine, the French Office National des Recherches et Inventions is organising a competition for the best means of preventing smoke emission from factories. The competition, entries for which will be received by the Office National, at the Avenue du Marechal, Gallieni, Bellevue, Paris, until October 1st, will extend to mechanical, chemical, and electrical means of eliminating smoke, and the trials of the various methods entered will commence early in 1927.

Institute of Wireless Technology.—Meetings of the Institute will take place on October 6th and November 10th, 1926. The first meeting will be held at the Engineers' Club, Coventry Street, London, at 7 p.m., and will take the form of a debate on the subject: "That it is impossible to obtain absolute purity of tone with a Valve Detector." The debate will be opened by Mr. Y. W. P. Evans, M.I.R.E., in support of the motion, and Mr. F. T. Fawcett, M.A., D.Sc., against.

London Electric Railway Extensions.—At the opening ceremony of the extensions to the London Underground Railway system, described elsewhere in this issue, Lt.-Col. J. T. C. Moore-Brabazon, M.C., M.P., Parliamentary Secretary to the Ministry of Transport, operated the starting signal to the "clear" position at the new Clapham South station, previous to driving a special train carrying some three or four hundred members of the companies and visitors, to the new depôt at Morden, where they were entertained to luncheon, the Rt. Hon. Lord Ashfield being in the chair. After the loyal toasts, Col. Moore-Brabazon proposed "The Company." He said we were passing through a curious phase of transport. After mechanical transport was introduced the traffic speed was increased for some years, but the stage was now reached when, with the increasing number of vehicles, the speed became less. He was no believer in the American overhead system, and we should have to look largely to the underground for the solution of our problems. He suggested that the name of the new railway should be the "Test Tube." It depended on the support given by the public to this addition to the system whether or not similar extensions would be run out in other districts. The Government did not see its way clear to use imperial taxes to subsidise any transport, which had got to pay its way. Unrestricted competition between the transport concerns was not helpful, and if those representing the different transport methods pulled together there would be room for all. London should be thankful to the "Lord of the Underground" for his initiative, organising ability, and his services.

In reply, Lord Ashfield thanked Col. Moore-Brabazon for his presence at the function. He regretted the delay to the completion of the extensions, which was due mainly to recent labour disturbances, and he requested the patience of the public with regard to Charing Cross station, which would take some time yet to complete. The total capital value of the whole of London's transport services was £125,000,000, of which £82,000,000 represented the underground system. Every route mile of the underground railways had a value of £850,000. For the extensions to justify themselves as a financial investment, 14,000,000 passengers per route mile would have to travel on them per annum. Great care and time had been expended in the preparation of the schemes; once money was spent on the underground, the service had to go on for many years. He was fortunate in having at his command the talent and experience necessary for the construction of such works. He paid a tribute to Mr. Knapp, Director of Construction, who was prevented by illness from being present, and who had worked very hard, and proposed that a message of congratulation should be sent to him. He extended his thanks to the consulting architects and engineers, the resident engineers and contractors, and to all the men who had been employed on the extensions, for the good work they had put into the constructions. The works had kept some 20,000 men off the "dole." He did not believe there were any other engineers in the world who could equal the resident engineers for ability and experience; they had shown marvellous skill in dealing with work of exceptional difficulty. Among the contractors named by Lord Ashfield were the Metropolitan-Vickers Electrical Co., Ltd., British Thomson-Houston Co., Ltd., Waygood Otis, Ltd., and the General Electric Co., Ltd. The Morden depôt had been built by the Underground's own people, who had also designed the signal and telephone systems and the rolling-stock. He was grateful to the Ministry of Transport, the London County Council and local authorities, for the facilities they had afforded for the carrying out of the new works. All the new capital had been raised on Government guarantee, without which the extensions would not have been possible. All the means of transport were needed, and co-operation between them was necessary if waste was to be avoided; the strong would have to help the weak. He thought that if all the different forms of transport were brought together, encouragement and hope could be given to those districts not so fortunate as Morden.

The Rt. Hon. Lord Farrer, in proposing "The Guests," said he saw in the extensions utility without damage to the beauty spots of the districts in question.

Sir Alfred Butt, M.P., and Mr. B. T. King, J.P., replied to Lord Farrer, Sir Alfred referring to an attractive feature of the Morden station, the new garage.

Col. Sir John W. Pringle, C.B., moved a vote of thanks to the chairman, to which a suitable reply concluded the proceedings.

Royal Air Force Flight Cadetships.—The Air Ministry announces that the next examination of candidates for entry as flight cadets to the Royal Air Force Cadet College, Cranwell, in January, 1927, will begin on November 16th. On this occasion not fewer than 35 cadetships will be offered. Forms of entry, which can be obtained from the Secretary, Civil Service Commission, Burlington Gardens, W.1, will not be accepted later than September 29th. All candidates must be fit and willing to fly and be between the ages of 17½ and 19½ years.

Popular Talks to Help Hospital Funds.—The Propaganda Committee of King Edward's Hospital Fund for London has arranged a series of popular talks on travel, science, and invention. The speakers are giving their services, and the proceeds will be devoted to the assistance of London hospitals. Some of the events likely to interest our readers are as follows:—

Thursday, October 7th, at 5 p.m.—"Seeing by Wireless," by Mr. H. L. Baird, at the Royal Institute of British Architects, Conduit Street, W. Chairman: Sir Richard Gregory.

Friday, November 12th, at 5 p.m.—"Liquid Air," by Mr. W. E. Garner, M.Sc., at the Fyvie Hall, Polytechnic, Regent Street.

Friday, November 19th, at 5 p.m.—"Artificial Production of the Human Voice," by Sir Richard Paget, Bart., also at Fyvie Hall.

Friday, November 26th.—"The Romance of Refrigeration," by Dr. Ezer Griffiths, F.R.S. (National Physical Laboratory, Teddington), also at Fyvie Hall.

Admission, per talk, 2s. 6d. (serial tickets 12s. 6d.). Seats numbered and reserved, 5s. (serial tickets 25s.). Application

should be made to the Secretary, King Edward's Hospital Fund for London, 7, Walbrook, E.C.4, or at the entrance to the meeting place.

A Congress of Electric Power Producers and Distributors.—On Tuesday next the first Congress of the International Union of Producers and Distributors of Electrical Energy will be opened, at Rome; it will continue until the following Sunday, after which the foreign visitors will be the guests of the Italian Association of Electrical Undertakings and the local electrical companies, and will be conducted on a tour lasting until Wednesday, September 29th, and ending at Florence. In addition to the technical sessions, there will be numerous visits to engineering works, and to the many places of interest in the neighbourhood of Rome, Terni, Assisi, Sienna, and other towns.

Electricity in Poultry Farming.—Preesall Council (Lancs.) hopes next month to inaugurate a scheme to supply poultry farms with electricity at attractive rates. Poultry houses will be equipped with an automatic equipment whereby the light will be switched on at an hour equivalent to a June dawn and thus encourage egg production. The condition under which energy will be supplied to poultry houses at specially low rates, is that its use will be restricted to the early morning hours. Artificial light is used by many Lancashire poultry farmers to promote egg production, and at the Lancashire County Council farm at Hutton, investigation has shown that the use of artificial light between the months of October and January causes each bird to yield an additional profit of 1s. 6d.

Fatality.—*The Times* reports that while working on the line at Kennington Underground Station, on September 12th, Frederick Norman, 21, a carpenter's labourer, came into contact with the live rail and received a fatal electric shock.

Educational.—University College, University of London.—We have received the programme of the Faculty of Engineering for the new session, which begins on October 4th. Prof. W. C. Clinton, B.Sc., M.I.E.E., is the head of the Department of Electrical Engineering; Prof. J. A. Fleming, F.R.S., is "Special Lecturer in Electro-communications," and Mr. C. C. Hawkins, M.A., M.I.E.E., is lecturer on electrical design.

Loughborough College.—The College opens on September 24th with the largest addition to its numbers since the war period. The "freshers" number over 50, and although the "leaving list" in July was very heavy, the Senior College will again muster 200 undergraduates. The Colonies will be strongly represented with men from Rhodesia, East Africa, and the Far East. The Public Schools also send a fair quota. A new feature of this year's enrolment will be the men who have gained the first awards under the Empire Scholarship scheme inaugurated by the Governors in 1925. The competition for those scholarships, which carry an award of £75 per annum for the full diploma course, was particularly keen. Candidates hailed from Canada, South Africa, Ceylon, and Palestine, in addition to the Homeland. The staff will have new men in the persons of P. F. Pock, B.Sc., Eng. Hons. (Lond.), A.C.G.I.; G. J. D. Schumach, B.Sc. Econ. (Lond.); R. P. A. Lewis, B.Sc. Eng. (Hons.) (Lond.), D. L. C. Hons.; F. Bourne, A.I.C., D.L.C. Hons. to the Senior College; and S. Eckersley, B.A. Hons. (Man.) to the Junior College.

Electrical Power Engineers' Association (Southern Division).—The first meeting of the Winter Session will be held on Friday, October 1st, at 7 p.m., at the E.L.M.A. Lighting Service Bureau, when Mr. W. J. Jones, B.Sc., will deliver a lecture on "Some Principles of Electrical Illumination." Mr. A. H. Bennett will preside. The eighth annual dinner to the members of the National Executive Council will take place at the Hotel Cecil on Saturday, October 2nd.

Appointments Vacant.—Resident assistant engineer and clerk of works, for the Severalls Mental Hospital, Colchester; clerk of the works, for the Mold U.D.C. electricity undertaking; general assistant (£225), in the Newark-on-Trent Corporation electricity department; technical and engineering assistant (generation section) (£850), technical and engineering assistant (transmission and transforming section) (£750), administrative assistant (£500), for the West Midlands Joint Electricity Authority; telephone maintenance inspectors (250 taels per month, tael=2s. 9¼d.), for the Shanghai Mutual Telephone Co., Ltd.; Diesel engine driver, for the Clacton-on-Sea electricity undertaking. (See our advertisement pages to-day.)

Sailing of Two Cable Ships.—*The Times* reports that the cable ship *Dominia* sailed on September 10th from Greenwich for Bamfield, British Columbia, on her maiden voyage, to lay the second Pacific cable which connects Bamfield with Fanning Island, 3,625 nautical miles—the longest cable in the world. Her cargo weighs 8,500 tons. The ship was built to the order of the Telegraph Construction and Maintenance Co., of Greenwich, by Messrs. Swan, Hunter & Wigham Richardson, of Newcastle-on-Tyne, the builders of the *Mauretania*. The cargo is coiled in four huge tanks, each accommodating nearly 50,000 cu. ft. of cable, which will be laid at the speed of nine knots. The trip is expected to occupy about four months. The cable ship *Faraday* sailed on September 12th from the Port of London to lay the new Pacific cable connecting Fanning Island, in the North Pacific, and Suva, Fiji. The cable has been manufactured by Messrs. Siemens Bros. & Co., Ltd., at Woolwich, for the Pacific Cable Board, and it will be laid at the rate of about 10 miles an hour. The work of laying will be carried on continuously day and night, and the whole length will be completed in about ten days.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

The marriage took place at Cyfarthfa Church, Merthyr Tydfil, on August 28th, of Mr. A. B. Cousins, A.M.I.E.E., and Miss Grace Edwards, youngest daughter of the late Rev. T. J. Edwards, of Merthyr Tydfil.

Inspectors Milne, Matthews, McMorland, Douglas, and Mackie, of the electrical department of the L.M. and S. Railway, have been presented with gifts from their fellow employés on the occasion of their retirement from the company's service. The presentations were made at a social gathering in Glasgow, presided over by Mr. A. S. Hampton, divisional electrical engineer. The aggregate service of the inspectors amounted to 205 years.

The marriage took place on August 30th of Captain Aston, A.M.I.E.E., and Miss Betty Moore, of Hastings.

Prof. V. H. Blackman, Sc.D., F.R.S., Prof. F. G. Donnan, C.B.E., D.Sc., LL.D., F.R.S., and Prof. F. A. Lindemann, Ph.D., F.R.S., have been appointed by Order of Council to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research, in the place of members who have retired on the completion of their terms of office.

Mr. F. G. Nesbitt, who has been for some time manager of the heating and cooking department of Credenda Conduits, Ltd., has now been appointed sales manager to the company.

The marriage took place at Leatherhead, on September 4th, of Mr. Harold Thomas Edmunds Gambrell, of Gambrell Bros., Ltd., wireless engineers, of Southfields, and Miss C. L. Mould, only daughter of Mr. Stephen Mould, of Moulds, Ltd., Leatherhead and Cobham. From the staff of Gambrell Bros., Ltd., the bridegroom received a dinner service.

Shoreditch Borough Council Law and Establishment Committee recommends that the permanent appointment of Mr. W. Weekes as borough electrical engineer be confirmed as from December 19th, 1926.

Obituary.—Mr. E. Thurnauer.—The *Electrical World* records the death in Paris in June, at the age of 63 years, of Mr. Ernest Thurnauer, managing director of the French Thomson-Houston Co., for two decades and at the time of his death a director of two Milan companies affiliated with the International General Electric Company—the Compagnia Generale di Elettricità and the Società Edison Clerici. Mr. Thurnauer, who, born at Nuremberg, Germany, became in early life an American citizen, and obtained his first practical experience in electricity at the shops of the Thomson-Houston Electric Company in Lynn, Mass. For several years he was on the directorate both of the British Thomson-Houston Company and the Allgemeine Elektricitäts-Gesellschaft of Berlin.

Dr. P. E. Lecher.—The death is reported from Vienna, at the age of 70 years, of Dr. P. Ernst Lecher, Professor of the Vienna University, who was well known for his electrical experimental work, and especially for experiments connected with the measurement of Herzian waves. He was a member of the Austrian Committee of the International Electrotechnical Commission.

Mr. F. Andrew.—The death is announced in his 68th year of Mr. Frederick Andrew, of North Woolwich, who was, until his retirement a year ago, for 41 years with W. T. Henley's Telegraph Works Co., North Woolwich. At the time of his retirement he was principal foreman at the works.

Mr. T. Harrison.—The death has occurred at Sunderland of Alderman Thomas Harrison. He had taken part in public affairs in Sunderland for nearly 50 years, and for the last few years had been vice-chairman of the Corporation Electricity Committee.

Will.—The late Mr. C. P. Markham, colliery owner, &c., of Chesterfield, left £611,305 gross and £515,883 net personalty.

New Companies Registered.

Priorsells, Ltd. (216,111).—Private company. Registered September 8th. Capital, £1,200 in 1s. shares. Objects: To acquire the benefit of certain patent rights and of certain applications for letters patent, to establish electrical appliances and apparatus of all kinds, including the erection and maintenance of all kinds of stations, equipment and apparatus for the transmission and receiving of signals, whether by means of radio action, land lines, cables or any combination thereof, &c. The subscribers (each with one share) are:—R. H. Kennedy, 62, London Wall, E.C.2, solicitor's manager; M. Rogers, 12, Alexandra Road, Well End, Shenley, Herts., solicitor's clerk. The first directors are to be appointed by the subscribers. Secretary: W. J. Kimmins. Solicitors: Ernest Salaman & Co., 62, London Wall, E.C. Registered office: 65, Cannon Street House, 110, Cannon Street, E.C.4.

Rubber Cables, Ltd. (216,113).—Private company. Registered September 8th. Capital, £2,000 in £1 shares. Objects: To carry on the business of dealers in electric cables, electrical equipment, appliances and accessories, rubber and general merchants, &c. The subscribers (each with one share) are:—D. C. Evans, 18, Ironmonger Lane, E.C.2, incorporated accountant; H. L. Evans, 88, Harberton Road, N.19, clerk. The first directors are not named. Solicitors: D. Cavell Evans & Co., 18, Ironmonger Lane, E.C.2.

J. Tee & Co., Ltd. (216,060).—Private company. Registered September 4th. Capital, £500 in 10s. shares. Objects: To acquire the business of an electrical and radio engineer carried on by J. Tee at 48, High Road, East Finchley, N.2. The permanent directors are:—J. Tee, 7, Leslie Road, East Finchley, N.2, electrical engineer (managing director); Gwendolen F. E. Sintzenich, 35, Upper Gloucester Place, W.1, secretary. Qualification, 1 share. Remuneration of above directors, £100 each per annum. Registered office: C/o Room 13, 31, High Holborn, W.C.1.

Telsen Electric Co., Ltd. (216,116).—Private company. Registered September 8th. Capital £1,500 in £1 shares. Objects: To acquire the business of a wireless transformer manufacturer now carried on by A. W. Macnamara, at 207, Aston Road, Birmingham, as "The Telsen Electric Co." The subscribers (each with one share) are:—A. W. Macnamara, 17, Electric Avenue, Witton, Birmingham, electrical engineer; W. T. Coggins, 115, South Road, Handsworth, Birmingham, engineer; G. W. Sparrow, 13, Newhall Street, Birmingham, incorporated accountant. A. W. Macnamara is managing director and chairman.

Thompson, Young & Co., Ltd. (216,136).—Private company. Registered September 9th. Capital, £2,000 in £1 shares (1,200 6 per cent. cum. preference and 800 ordinary). Objects: To acquire the business of manufacturers of and dealers in wireless sets carried on by C. W. Thompson. The permanent directors are:—C. W. Thompson, 26a, Bebington Road, Lower Bebington, Ches.; S. E. Young (chairman), 92, Highbury New Park, N.5. Qualification, 100 shares. Remuneration, £25 each per annum. Secretary: Mabel J. Thompson. Solicitors Young & Sons, 29, Mark Lane, E.C.3. Registered office: 26a, Bebington Road, Lower Bebington, Ches.

Kelvinator, Ltd. (216,150).—Private company. Registered September 10th. Nominal capital, £65,000 in 40,000 7 per cent. cumulative preference shares of £1 each and 500,000 ordinary shares of 1s. each. The objects are:—To adopt an agreement with Kelvinator of Canada, Ltd., and to carry on the business of electrical and mechanical engineers, suppliers of electricity, and manufacturers of and dealers in apparatus used in connection with the generation, distribution, supply, accumulation and employment thereof, &c. The subscribers (each signing for 10 preference shares) are:—L. G. Hawkins, 30-35, Drury Lane, W.C.2, director of L. G. Hawkins and Co., Ltd.; and S. J. S. Parker, St. Anthony, Elmswood Avenue, Feltham, secretary of a public company. The first directors are:—A. H. Goss (chairman), H. Lewis, and L. G. Hawkins. Remuneration, £120 each per annum (chairman £200). Solicitors: Lawrence, Jones & Co., 16, St. Helen's Place, E.C. The registered office is 30-35, Drury Lane, Kingsway, W.C.2.

Ebonite Manufacturing Co., Ltd. (216,106).—Private company. Registered September 8th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of manufacturers and dealers in ebonite, bakelite, and all kinds of rubber, moulding compositions and like substances, and goods manufactured therefrom, &c. The permanent directors are:—L. Partridge, Meadow Road, Quinton, Birmingham, ebonite manufacturer; M. E. H. Parkin, 45, Kensington Gardens Square, W.2, engineer; F. E. Crawley (chairman), address not stated.

Official Returns of Electrical Companies.

Lancashire United Transport and Power Co., Ltd. (formerly Lancashire United Tramways, Ltd.).—Particulars filed of £300,000 first mortgage debenture stock, authorised May 26th, and covered by trust deed dated August 27th, 1926, charged on shares and loan capital of the South Lancashire Tramways Co., and the other assets of this company, present and future, including uncalled capital, the amount of the present issue being £250,000. Trustees: Rt. Hon. Viscount St. Davids and M. B. Snell.

Eastern Telegraph Co., Ltd. (6,338C). — Capital, £7,000,000 in £5,000,000 ordinary stock and £2,000,000 preference stock. Return dated June 22nd, 1926. All stock taken up and fully paid. Mortgages and charges, £2,000,000.

Sloan Electrical Co., Ltd. (61,528).—Capital, £60,000 in 10,000 preference and 50,000 ordinary shares of £1 each. Return dated July 28th, 1926. 8,000 preference and 40,000 ordinary shares taken up. £41,500 paid. £6,500 considered as paid. Mortgages and charges, nil.

Ellis & Sons (1923), Ltd.—J. Rutherford, of 9, Basinghall Street, E.C., was appointed receiver and manager on August 27th, 1926, under powers contained in instrument dated January 1st, 1925.

Seear, Scott & Co., Ltd.—A. J. Kirby, of 7, Drapers' Gardens, E.C., was appointed receiver and manager on August 26th, 1926, under powers contained in debentures dated January 26th and August 28th, 1917, January 21st, 1919, and March 27th, 1920

Electrical and Allied Instrument Manufacturing Co., Ltd.—S. R. Macdonald, of 29, The Mall, Surbiton, and G. C. McEwen, 35, Copthall Avenue, E.C., were appointed receivers on September 1st under powers contained in debenture dated July 28th, 1926.

Orford Electric Light and Power Co., Ltd.—Issue on August 16th of £100 and on August 27th, 1926, of £100 debentures, parts of a series already registered.

Yorkshire Switchgear and Engineering Co., Ltd. (formerly the T. S. Switchgear and Construction Co., Ltd.) (93,698).—Capital, £10,000 in £1 shares. Return dated June 25th, 1926. 5,332 shares taken up. £2,332 paid £3,000 considered as paid. Mortgages and charges, £4,665. Return of allotments made up to July 2nd, 1926, shows a further 50 shares allotted for cash.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

Companies Struck off the Register.—The names of the undermentioned companies have been struck off the register and they are thereby dissolved:—

Aerophones, Ltd
Hardware & Electrical Co., Ltd.
Lacland Electrical Manufacturing Co., Ltd.
Residential Wireless, Ltd.
Shaw Electrical Transmission Co., Ltd.
Stafford Radio Co., Ltd.
Waterloo Electric Co., Ltd.
Westminster Radiophone Co., Ltd.
Wholesale Wireless Co., Ltd.
Wireless Accessories Stores, Ltd.
Wireless Supplies, Ltd.

Canadian Marconi Co., Ltd.—The net profit for the past year was $37,984. The report records an expansion in the sale of radio apparatus and in the hire of apparatus to marine vessels A loss was incurred in the coast stations operated for the Canadian and Newfoundland Governments; negotiations are in progress for a revision of the subsidy. The new beam stations at Drummondville and Yamachiche are nearing completion, and acceptance tests will be carried out shortly. The working of these stations is expected to be profitable to the company.

Mexican Light and Power Co.—The net earnings for 1925 were $9,091,940 (Mexican), against $8,938,278 in 1924. After meeting administration and general expenses, the balance is devoted to the meeting of capital expenditure, and there is thus no surplus available for meeting the interest on the 6 per cent. cumulative income bonds.

Mexico Tramways Co.—The gross earnings for the past year decreased by $1,695,336 (Mexican) to $9,997,033, and the result was a net deficit of $530,255 (after providing for depreciation and taxation), as compared with a profit of $154,579 in 1924. The ratio of gross expenditure to gross earnings rose from 84.91 to 92.11 per cent. The 'bus services proved unremunerative, and were discontinued. The adverse result is attributed to "jitney" competition and a two weeks' strike.

Automatic Telephone Manufacturing Co., Ltd.—An interim dividend of 9d. per share (3¾ per cent.) has been declared on the ordinary shares. This is the first payment of an interim dividend; last year's dividend on the ordinary shares was 10 per cent.

International Automatic Telephone Co., Ltd.—An interim dividend similar to the above has been declared by this company.

Dundee, Broughty Ferry & District Tramways Co., Ltd.—The accounts for the year ended July 31st last show a profit of £6,313, to which is added £144 brought forward, making £6,457. After meeting debenture interest, it is proposed to pay a dividend of 7 per cent. on the ordinary shares, to transfer £1,000 to reserve, and to carry forward £264.

Stock Exchange Notice.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

International Automatic Telephone Co., Ltd.—20,000 ordinary shares of £1 each fully paid, Nos. 360,001 to 380,000. 50,000 new ordinary shares of £1 each fully paid, Nos. 380,001 to 430,000.

Quebec Power Co.—Dividends of $1¼ per share on the preferred shares and $1½ per share on the common shares have been declared in respect of the quarter ending September 30th.

Eastern Telegraph Co., Ltd.—The following quarterly dividends have been declared:—At the rate of 3½ per cent. per annum, less tax, on the preference stock; and 2½ per cent. on the ordinary stock, free of tax.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors have declared a quarterly dividend of 5s. per share, free of tax.

Midland Electric Corporation for Power Distribution, Ltd.—An interim dividend at the rate of 10 per cent. per annum has been declared on the ordinary shares, as in 1925.

British Insulated Cables, Ltd.—The directors recommend the payment of an interim dividend of 1s. per share (5 per cent.) on the ordinary shares, as in 1925.

Cammell, Laird & Co., Ltd.—The directors have decided not to pay interim dividends on the preference and ordinary shares.

Manila Electric Corporation.—A dividend of 50 cents per share has been declared on the common stock for the quarter ending September 30th.

Globe Telegraph and Trust Co., Ltd.—The usual interim dividend (5s. per share net) has been declared on the ordinary shares.

International Telephone and Telegraph Corporation.—A quarterly dividend of 1¼ per cent. has been declared on the common stock.

Hendon Electric Supply Co., Ltd.—An interim dividend at the rate of 10 per cent. per annum, free of tax, has been declared on the ordinary shares.

Electric Supply Corporation, Ltd.—The directors have declared an interim dividend at the rate of 8 per cent. per annum on the ordinary shares.

Stewarts & Lloyds, Ltd.—The following interim dividends are announced:—Preference shares: at the rate of 6 per cent.: preferred ordinary shares: at the rate of 10 per cent.

Stocks and Shares.

MONDAY EVENING.

BRAZILIAN Tractions and other members of this group have quietened down to some extent, though business remains tolerably active, and the liveliest interest is taken in regard to the reported intentions of Mr. Alfred Loewenstein. This gentleman is credited with the intention of forming a huge combination in which will be included the shares of the Brazilian Traction, Barcelona Traction, several of the Mexican utility companies, and a few others of the same class. The recently introduced Sidro shares form the hub of the market speculation. These were down in price not long ago to £8, whereas now they stand at 14. The market being a limited one, it is not surprising that the price should have soared in this extra-

ordinary fashion, having regard to the expectations formed around the projects attributed to Mr. Alfred Loewenstein.

Particulars of Sidros were given here at the time that Stock Exchange dealings started in the shares. The latter must be regarded, it seems to us, as a rich man's gamble, in the present stage of development, for there might be a setback as abrupt as the rise was. On the other hand, optimism in a concern of this kind can reach lengths which do not apply to ordinary Stock Exchange securities, though for the sake of safety it is probable that the cautious investor will prefer to stick to the shares of the companies which, according to gossip, are to be included in the gigantic merger.

A statement has been issued by the Mexican Light & Power, the company which controls the Mexico Tramways, from which it would appear as though progress is still very slow in the distressful country where these companies operate. The immediate effect was to depress the price of Mexico Tramways, but the fall has been partially recovered. The 5 per cent. bonds at 67½ are 3 points lower on the week: the shares are dull at 15½. Disappointment is felt at the non-appearance in the circular of any scheme for dealing with the arrears of dividend on Mexican Light & Power preferred shares, for rumour has been busy, during the last few months, with the assumption that it should not be long before a plan might be submitted showing in what manner the arrears would be dealt with, the impression being that this would come through a funding scheme.

Brazilian Tractions reacted to 120, after being advanced to 122½. Barcelona Tractions remained about 39. The Stock Exchanges of Canada are paying interested attention to the Loewenstein rumours, and it will be remembered that reference has been frequently made here to the fact that a good deal of the buying which lifted Brazilian Tractions to their present figure, emanated from Montreal.

The excitement over shares in the cable construction companies has given place to a quieter market aspect, although prices are fairly well maintained in most cases. There is not quite so much pressure to buy as there was; on the other hand, a few shares have come in. Callenders, British Insulated, Johnson & Phillips, and others in this group hold their rises with noticeable strength, but the tendency is a little easier for choice, as the Stock Exchange saying goes. Henleys are ¼ down at 4½. Telegraph Constructions have been wanted, and more attention has been shown in Telephone Manufacturing shares, the price of which strengthened to 7s., which represents a discount of 6d. per share upon the new issue, recently made, of 10s. shares that were sold at 7s. 6d. This sale enables redemption of the company's income debentures at the end of the present year, and will leave the shares with no charge in front of them. British Aluminiums reacted to 47s. 6d. Electric Constructions are 6d. better at 3ls. 9d. English Electric 5½ per cent. debenture, a stock that rarely comes to market, has been done at 101 and a fraction higher.

The cable group is very firm, although no quotable alterations have to be recorded. The Eastern quartette is well employed with traffic, and the Eastern Telegraph Company is opening a Paris office on its own account. Hitherto the business has been conducted by an agency in Paris. The company, like other members of the same group, is continually introducing improved methods of working and adopting the latest inventions that offer. Eastern 3½ per cent. preference is better at 66½. Wireless shares are quiet. Marconis have been a slightly better market, with buyers about at 15s. Canadian Marconis met with demand at 3s. 9d. Radio Common are firm at 10½. Cuba Submarines strengthened to 7.

The market for Home Railway stocks is lifeless. No further attention was aroused by the opening, on Monday, of the Morden extension: Districts drooped to 5½. Metropolitan Consolidated is down 1¼ to 62. London Electric Railway ordinary stock, officially quoted at 48-53, changed hands at 48¼ the other day. British Electric Tractions are steady. In the foreign division, Manila Electric Railway ordinary stock has gained several points at 39. Anglo-Argentine Tramways first preference rallied to 3.

Edmundson's are better at 26s. Newcastle-on-Tyne ordinary went back. Whitehall preference moved up to 20s. 6d. No change occurred in the list of London shares. Considerable activity rose around Automatic Telephones and Internationals. Both companies have declared an interim dividend of 9d. per share, and the announcements brought in a number of buyers. Automatics put on ½ to 53s. 9d., and Internationals, moving more sedately, are up to 46s. 3d.

Babcock & Wilcox remain one of the firmest members of their market. The price is better at 53s. 9d. Other iron and steel shares move within narrow margins; hopes of a coal peace are qualified by a wait-and-see attitude. The rubber share market keeps hard, and new issues here, as in other Stock Exchange departments, are contemplated in the near future. There is plenty of capital available for investment, and its owners are willing to give heed to investments, or speculations, that offer attractive value for money.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1924.	Dividend. 1925.	Price Sep. 13 1926.	Rise or fall.	Yield p.c.
Bournemouth and Poole	£1	14	14	55/9	—	5 0 5
Brompton Ordinary	£1	10	10	1⅞	—	5 12 2
Charing Cross Ordinary	£1	15	15	44/6	—	6 14 10
do. do. 4½ Pref.	£1	4½	4½	17/6	—	5 2 10
Chelsea	£1	12	12	2	—	6 0 0
City of London	£1	15	15	49/6	—	6 1 3
do. do. 6% Pref.	£1	6	6	22/6	—	5 6 8
Clyde Valley	£1	8	8	27/-	—	5 18 6
County of London	£1	15	15	59/6	—	5 0 10
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	£1	7	8	26/-	+1/-	6 3 1
do. 7% Pref.	£1	6	7	22/6	—	6 4 5
Elec. Supply Corporation	£1	10	10	31/3	—	6 8 0
Kensington Ordinary	£5	15	15	13½	—	5 11 1
Lancs. Light and Power	£1	7½	7½	24/-	—	6 5 0
London Electric	£1	10	10	32/-	—	6 5 0
do. do. 6% Pref.	£5	6	6	5⅝	—	5 11 7
Metropolitan	£1	11	11	37/-	—	5 18 11
do. 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Midland Counties	£1	5½	6	21/-	—	5 14 3
Newcastle-on-Tyne Ordinary	£1	7	7	21/3	—9d.	6 11 9
do. 5% Pref.	£1	5	5	18/9	—	5 6 8
do. 7% Pref.	£1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	£10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	£1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	£5	17½	17½	16¼	—	5 8 6
South London	£1	15	15	2⅜	—	5 9 1
South Metropolitan Pref.	£1	7	7	1¼	—	5 12 0
Urban Ordinary	£1	4	7	1⅜	—	5 17 11
do. 6 % Pref.	£1	6	6	20/6	—	5 17 1
Westminster Ordinary	£1	15	15	43/9	—	6 17 2
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	20/6	+3d.	7 6 4
Yorkshire Elec.	£1	8	8	27/-	—	5 18 6

HOME RAILS.

Central London Ord. Assented	Stock	4	4	69	—	5 15 11
Metropolitan	,,	5	5	62	−1½	8 1 4
do. District	,,	3½	3½	51½	—½	6 15 11
Underground Electric Ordinary	£10	Nil	Nil	3⅜	+	Nil
do. do. "A"	£1/-	Nil	Nil	11/6	—	Nil
do. do. Income	Bonds	6	6	100	—	*6 0 0

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	24¾	—	6 1 3
Automatic Telephone	£1	3	10	2¹¹/₁₆	—¼	3 16 0
Chili Telephone	£5	5	6	7⅜	—	4 1 4
Cuba Sub. Ord.	£10	5	5	7	+¼	7 0 0
Eastern Extension	£10	10	10	19½	—	*5 4 8
Eastern Tel. Ord.	Stock	10	10	189½	—	*5 5 0
Globe Tel. and T. Ord.	£10	10	10	19½	—	*5 3 11
do. do. Pref.	£10	6	6	11¼	—	5 7 10
Great Northern Tel.	£10	22	20	27½	—	7 5 6
Indo-European	£5	8½	10	47½	—	*5 5 0
Marconi	£1	10	Nil	15/-	—	... ...
Marconi-Marine	£1	10	7½	20/-	—	7 10 0
Oriental Telephone Ord.	£1	12	12	46/3	—	*5 3 10
United R. Plate Tel.	£5	8	8	8½	—	*4 17 0
Western Telegraph	£10	10	10	18½	—	*5 7 8

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref.	£5	5½	5½	3	+1/16	9 3 4
do. do. 2nd Pref.	£5	6	6	2½	—	11 3 2
do. do. 5% Deb.	Stock	5	5	76	—	6 11 7
British Electric Traction Ord.	,,	7	8	140	—	5 14 4
do. do. 6% Pref.	,,	6	6	110	—	5 9 1
Brazil Traction	£100	4	5	120	−2	4 3 4
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	86½	—	5 15 7
do. do. Preferred	,,	96/-	126/9	114½	—	*5 8 1
do. do. Deferred	,,	129/5	8	143	—	*5 11 11
do. do. Deb.	,,	4½	4½	79	—	5 7 7
London & Sub. Trac. 5% Pref.	£1	2½	Nil	5/-	—	Nil
London United Tram. Deb.	Stock	4	4	47	—	8 10 2
Mexico Trams, 5% Bonds	—	5	5	67½	—3	7 8 2
Mexican Light Common	£100	Nil	Nil	31½	—	Nil
do. Pref.	£100	Nil	Nil	85½	—	Nil
do. 1st Bonds	—	5	5	69	—	7 5 0
Yorkshire (West Riding)	£1	5	—	11/6	—	... ...

MANUFACTURING COMPANIES.

Babcock & Wilcox	£1	12	13	2¹¹/₁₆	+1/16	4 16 9
British Aluminium Ord.	£1	5	10	47/6	—9d.	4 4 8
British Elec. Transformer Pref.	£1	Nil	7	18/3	—	7 13 5
British Insulated Ord.	£1	15	15	3⅞	+1/16	4 7 3
Brush Ord.	£1	10	10	26/3	—	7 12 4
Callenders	£1	15	15	3⅛	—	4 11 9
do. 6½% Pref.	£1	6½	6½	23/9	—	5 9 5
Crompton Ord.	£1	Nil	Nil	13/3	—	... ...
Edison-Swan	4/-	10	10	12/9	—	3 2 7
do. 5% Deb.	Stock	5	5	86	—	5 16 3
Electric Construction	£1	10	10	31/9	+6d.	6 6 0
Enfield Cable Pref.	£1	7½	7½	1¾	—	6 6 4
English Electric	£1	5	Nil	16/3	—	... ...
do. do. Pref.	£1	6	6	18/-	—	6 13 4
Gen. Elec. Pref.	£1	6½	6½	23/-	—	5 13 1
do. Ord.	£1	5	7½	31/-	—	4 16 9
Henley	£1	16	20	4¼	—¼	4 16 10
do. 4½% Pref.	£5	4½	4½	4¼	—	5 6 0
India-Rubber	£1	5	5	23/-	—	*4 6 11
Johnson & Phillips	£1	10	17½	66/3	—	5 5 8
Met.-Vickers Ord.	£1	8	8	25/9	—	6 4 9
do. Pref.	£2	8	8	2⅝	—	6 14 9
Siemens Ord.	£1	7½	7½	32/-	—	4 13 9
Telegraph Construction	£12	20	10	28½	—	*4 3 6

*Dividends paid free of Income Tax.

The World Power Conference.—II.

Improving the Domestic Electricity Load Factor.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

FROM the Swiss, German, and Norwegian reports at the World Power Conference on the applications of electricity to agriculture in these respective countries, it is evident that great importance is attached to the adoption of electricity for farm-house domestic purposes, such as cooking and heating, as well as its use for milking and other applications on the farms themselves. The general introduction of electricity for these purposes presupposes that energy will be supplied at a relatively low price.

Dr. Alfred Ekstroem, of Sweden, in the course of his remarks during the discussions in the Electricity in Agriculture Section, gave some interesting particulars concerning the way in which the Stockholm electricity supply undertaking is tackling the problem. This is by the introduction of a new type of electric thermal-storage cooker. This cooker, with its water preheater, is designed to consume an almost uniform quantity of electricity, day and night. Hence the load factor is high, and consequently energy can be supplied at a low price. There have been many attempts to tackle the thermal-storage cooker principle, in which the present writer has taken some part. However, the cooker described by Dr. Ekstroem seems to have overcome practically all the difficulties of the early apparatus; hence his comments are of particular interest. He pointed out that in most cases, if such cookers were installed, it would not even be necessary to increase the size of the supply mains.

In Stockholm at present there are some 600 thermal-storage cookers in daily use. These cookers, which are of the Seves type, are constructed in accordance with a special design evolved by the Stockholm electricity supply undertaking.

The Seves cooker consists of a cast-iron block, well insulated and mounted in a suitable casing so as to conserve the heat stored in it. During the period when the cooker is not used, *i.e.*, during the night, the iron block stores up heat, so that by the morning a high temperature has been reached (about 930 degrees F., or 500 degrees C.). This stored-up heat replaces the electrical energy which would otherwise be required for the daily cooking requirements. The upper side of the block, which has a flat and smooth surface, is used for the actual cooking, and the boiling of kettles, saucepans, &c. When not in use, it is covered with an insulated, hinged, cap-like cover, to retain the heat.

At first an attempt was made to use an absolutely regular current supply, but this was afterwards dropped. The iron block now receives its heat partly from a permanently connected 300-watt heater and partly from a similar heater, switched on at certain periods, as soon as the temperature falls below, say, 930 deg. F. (500 deg. C.). Thus a cooking surface at this temperature is always available. The transmission of heat from the block to the utensil or pan can be conveniently regulated by means of a distance piece between the cooking block and the utensil.

The lower side of the iron block transmits heat to an oven kept, by means of a special thermostatic device, at a fairly regular temperature of 195 deg. F. (90 deg. C.). This oven can be used for the slow heating or simmering of foods (soups, stews, &c.) which have already been partly cooked on the top hot plate.

Incidentally, by the help of this new form of cooker, the preparation of meals can be very considerably facilitated by better utilisation of foodstuffs and the saving of labour.

(*a*) *Better Utilisation of Foodstuffs.*

When cooking is done with the food exposed to the air above an open fire, or by means of gas or electricity, the liquid in the pot reaches a temperature of 212 deg. F. (100 deg. C.) whilst steam is continually given off. When fresh meat is cooked in the open air at 212 deg. F., some of the nutrient properties of the meat are lost along with the steam, and the meat consequently does not taste so good.

When the thermal-storage cooker is used, the following results are obtained:—

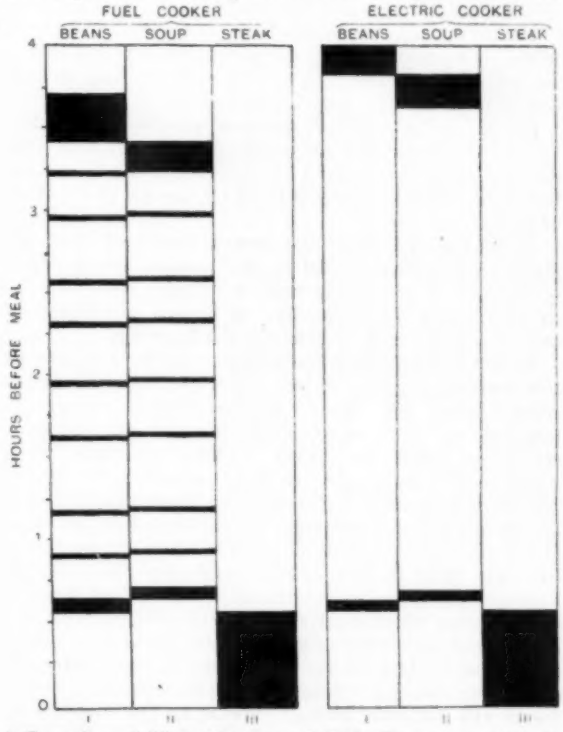
(1) On the meat being slowly cooked in the oven, after having been rapidly heated up and sealed externally on the cooking block, it becomes more succulent, more tender, and richer in nutriment.

(2) Consommés (meat extracts) cooked in the oven require less meat than when cooked in the open. In the second case, 4 to 6 lb. (2 to 3 kg.) of meat to one quart (1 litre) of water are required; in the first case only 2 lb. (1 kg.) of meat.

(3) Whereas pickled or salt meat becomes hard in boiling water, it becomes succulent and soft at a regular heat of about 195 deg. F. (90 deg. C.).

(*b*) *Saving of Labour.*

By using the Seves cooker, a considerable amount of labour is saved, since, as soon as a pot containing meat, potatoes, vegetables, porridge, &c., has been heated up to 212 deg. F., it can be placed in the oven, where the contents become fully cooked after a short time, without having to be stirred or attended to in any way.



A Comparison of Work (Aggregate of Black Portions) required for Cooking and Attendance with a Fuel-fired Cooker and a Thermal-Storage Electric Cooker.

This is especially advantageous when cooking meat extracts, stews, porridges, pickled meat, and so on; the casserole or saucepan, with its contents, is heated up on the cooking block in the evening. It is then placed in the oven over-night, and the cooking process is thus carried on and completed automatically. Foodstuffs placed in the oven retain their heat for several hours, which is of very great advantage when meals have to be served at irregular intervals.

Strange to say, the warming-up oven of the Seves electric cooker has been the cause of the introduction of

a similar oven for slow heating in gas cookers. On account of the risk of gas escaping, due to the small flame being extinguished, it is hardly to be recommended that the oven of a gas cooker should be used for slow cooking during the night.

In the course of a series of experiments, in which cooking according to a full daily programme was carried out, it was found that the cook's labour could be reduced by three hours per day. When using the electric thermal-storage apparatus, the cook, as mentioned above, does not require to give constant attention to the cooking. Indeed, this constant and regular heat, seen from the point of view of preparing meals, offers very great advantages.

The advantages of the modern electric thermal-storage cooker may be summed up as follows:—

(1) It provides an oven which is kept at a temperature of 195 deg. F. (90 deg. C.). This is extremely useful for the preparation of meals.

(2) It gives a cooking surface heated *constantly* to a temperature of about 930 deg. F. (500 deg. C.), which, by means of a convenient method of control, transmits any required heat to the cooking utensil. It solves the problem that has puzzled so many hot-plate designers, of rapidly boiling a small quantity of water. Experience shows that the heat developed corresponds to that of a heating surface of a 2.5-kW electric hot-plate.

(3) It permits of utilising energy, say, for a separate cooking and baking oven, by temporarily switching the current off the heating-up oven and the cooking surface, and on to such apparatus as an extra hot-plate or oven.

(4) It supplies any excess current to a well insulated pre-heater for water, large enough to cover the hot-water requirements of a household.

(5) (*a*) Equally from the point of view of the consumer as from that of the supplier, the uniform current needed for the heating-up oven and the cooking surface can be supplied at a very low price.

(*b*) From the supplier's point of view it is desirable, and for the consumer not really disadvantageous, that the heating of water shall be carried out wholly during the night. This is accomplished by the aid of this type of cooker.

Of course any additional energy employed over and above that normally used by the cooker, for purposes mentioned under paragraph 3, would naturally be charged for at a higher rate. A higher rate would, of course, also have to be paid for the lighting.

In conclusion, attention is drawn to the diagram on the previous page, which illustrates the labour necessary when using the Seves thermal-storage cooker as opposed to that when cooking with an ordinary wood or coal fuel oven. This is one of a number of graphs, the result of careful tests carried out during the last few months by the Stockholm electricity supply undertaking. In certain cases, by using the Seves cooker, it may be observed that the housewife can save as much time as nine hours per day. On an average, she saves, as mentioned above, 3 to 4 hours a day, during which time she is *entirely* freed from the necessity of attending to either a fire, the cooker, or the food being cooked (as the latter does not need stirring, skimming, basting, or any other attention whatsoever, for it will not even burn). Owing to the adoption of the "fireless cooker" principle for the oven, the cooking operation has to be started a little earlier. On the other hand, food cannot be over-cooked if left too long.

It may therefore be safely asserted that cooking by electricity is now fully established as an economical process, regardless of the saving in meat, which latter alone means a great deal. It is, further, a method which is ahead of all existing ways, due to the introduction of the modern thermal-storage cooker principle. Unfortunately this cooker is not on the market, as it has only been developed, so far, to supply the consumers on the mains of the Stockholm electricity supply undertaking. Still, the information supplied by Dr. Ekstroem should prove of very great interest, and thanks are due to him for the valuable information he has given regarding this new method of improving the domestic load factor.

The Sectional Meeting at Basle.

By THEODORE RICH.

A FINAL meeting of those attending the World Power Conference was held on the morning of September 8th, and was presided over by Dr. Tissot. A series of resolutions which had been arrived at during a meeting of the Executive Council of the World Power Conference on the previous day was read, and the following is the substance of these resolutions: The International Committee should be appointed in order that experts in various countries might exchange experiences on the calculation, erection, and operation of large dams, and it was noted with satisfaction that the French Government, following a suggestion made by the Congress of the French Association for the Advancement of Science, held last year at Grenoble, was also giving consideration to this matter with a view to the submission of a report through diplomatic channels.

In view of the points brought out in the report presented to the Congress by M. Réné Nesser, of Switzerland, to the effect that different methods were used in Europe and in America to determine the efficiency of water turbines, a wish was expressed that the International Electrotechnical Commission should continue the work it had already commenced in this direction, with the co-operation of experts from various countries.

In accordance with the report presented by M. Uytborck, of Belgium, it was held advisable to compile annually statistics dealing with the utilisation of power in all countries on a comparative basis, and with that end in view, in co-operation with the Union Internationale des Producteurs et Distributeurs d'Energie Electrique, whose headquarters are at 25, Rue de la Pépinière, Paris, and with the assistance of the National Committees of the countries associated with the World Power Conference, it was resolved so far as practicable to compile such statistics.

As pointed out in the report (No. 14) of Messrs. R. Halter and F. Scaffernack (a paper on the question of the utilisation of the Danube as a power-generating waterway), there is a lack of knowledge concerning the influence of dams and channels on the transport and deposit of solid matter by rivers; it was resolved, therefore, to invite the different National Committees of the W.P.C. to study the question and to prepare reports to be presented at a later session of the Conference.

The National Committees of the W.P.C. should be asked to give consideration to the methods of obtaining the constants in Chazy's formula for the velocity of water in conduits.

It may be noted that both these matters, concerning water flow, are of considerable importance in connection with the design and operation of water power undertakings, the deposit of silt in front of dams and weirs often giving rise to great difficulties.

As suggested by M. Cerny, it is of general interest for information to be collected concerning the laws in force in different countries on water power development, and therefore it was resolved that the National Committees of the W.P.C. in different countries should be asked to collect information and prepare papers on these laws.

As suggested by the General Reporter of the Agricultural Section, M. Ringwald, of Switzerland, the different National Committees of the W.P.C., with a view to the further consideration of the question of electro-farming and the exchange of ideas between countries on this subject, the National Committees were invited to prepare further reports on the subject, or to complete the reports already presented, dealing with it, and, as suggested by M. Landry, of Switzerland, consideration should be given as to the best means of compiling statistics dealing with the hydraulic power resources of the world, on a comparative basis.

It was also decided to address the governments of every country urging the giving of every facility for the interchange of power between countries with the utmost liberality, in order to encourage the use of electrical

power, and in connection with this, co-operation should be made with the (Institution) Natonale des Grands Résaux, of Paris.

In addition to the above resolutions, Dr. E. Huber Stockar had made a communication to the Executive Committee, which supported it, regarding the 16 papers presented by representatives of 11 countries on railway electrification. There was no longer a question of controversy regarding the choice of system. Different systems had been successful in different countries, although there was the problem connected with the utilisation of power for railways from industrial circuits, and experiments were in progress in this direction; such utilisation would tend to make the electrical operation of railways easier. The progress of electrification had now reached such a stage that, provided questions of finance were properly dealt with, there was no longer any technical risk in the matter. It was desirable, therefore, for operating data to be prepared with the utmost fairness and frankness by those in charge of electrical railways, in general accordance with the schedule questionnaire proposed in the General Report by Dr. Stockar, dealing with electric traffic and the equivalent steam traffic replaced, so that those contemplating electrification could obtain information of a useful and encouraging nature, and confidence would thus be given which would hasten the march of progress.

The International Executive Council of the W.P.C. communicated to the meeting its grateful acknowledgments to those who had contributed papers and to others who had taken part in the work. Thanks were also given to Dr. Tissot, Dr. C. Hubscher, and Mr. H. F. Zaugger, for the very efficient way in which the meetings had been organised, and to the Swiss Government, the Swiss National Committee, the Basle Government, the Federal Railways, and many others, for the assistance given towards the success of the Conference, and for the charming hospitality accorded to members and the ladies who accompanied them.

Mr. Dunlop stated that a decision had been arrived at that there should be organised a permanent central office for the activities of the W.P.C., and that contributions should be made by the various National Committees towards the support of such an office in London. He said that it had been suggested that a fund for research in connection with the fundamental problems connected with power should be established, so that young men of scientific attainments could be engaged to discover some of the secrets of nature which were still undiscovered, and electric power distribution could be encouraged. A certain gentleman was prepared to give £100 a year for five years to that end, and he (Mr. Dunlop) hoped that in time the International Council of the W.P.C. would find it possible to create a fund for such purposes. As a result of the assembly at Basle, the Executive Committee felt that the W.P.C. had been consolidated. He had never attended so excellently organised a conference before.

Dr. Tissot, in concluding the proceedings, said that he was persuaded that the results of the Conference at Basle would be to give continuation to the work started by the W.P.C. in London (in 1924), and that, as a result, engineers would be stimulated to give particulars of the work on which they were engaged.

The Congress would create an atmosphere of mutual confidence. He hoped that those who had come to Switzerland would take away with them pleasant recollections. He considered that one of the most important results of the meeting would be the formation of personal associations between many of the members.

Among those at Basle were Sir John and Lady Snell, Mr. and Mrs. Chattock, Mr. and Mrs. Roger Smith, Mr. Patchell, Mr. Petersen, Col. O'Brien, Mr. Kettle, Mr. Bremner, and Dr. Evans.

A Group of Members at Andermatt.

A New Coal-Furnace Equipment.—A new coal-burning equipment, the "Pulverzone," is described in *Power*, and has been developed by the Cokal Stoker Corporation. By means of a controlled air blast across the furnace front over the fire, the coal is spread and a turbulence produced which intimately mixes, it is claimed, the air and the volatile. The fine particles of fuel are burnt in suspension, and the larger parts are spread over the entire grate area. Immediately beneath the ledge over which the coal feeds into the furnace is installed a series of air nozzles for supplying the blast. The pressure used varies with the character of the coal and the quantity being fed, and is between 5 and 30 lb. per sq. in. It is claimed that 2 per cent. of the rated boiler capacity is required to produce turbulence, feed the coal, and operate the entire mechanism. Passing through the falling curtain of coal, the blast carries the fines, which constitute 60 per cent. of ¾-in. screenings, into the furnace space, where they ignite in suspension. The coal lumps are distributed over the fuel bed according to their weight, the coarser coal dropping down directly in the coking zone at the front, while the lighter pieces pass towards the rear. Segregating the coal in this way, so that like sizes fall into the same zone, gives a porous fuel bed that offers low resistance to the air supply, so that intensive combustion with minimum draught is possible.

The Electrical Exports of Sweden.

The Figures for 1924 and 1925 compared.

THE following figures showing the exports from Sweden of electrical goods, machinery, and apparatus in 1925 are extracted from the recently-issued official trade statistics. The figures for 1924 have been added, together with notes of increases and decreases :—

	1924. Kr.	1925. Kr.	Inc. or dec. Kr.
Accumulators and parts thereof—			
Unmounted cells :			
Total	91,000	201,000	+ 110,000
To Japan	*	186,000	—
,, Great Britain ...	44,000	*	—
Accumulator plates :			
Total	115,000	54,000	– 61,000
To Denmark	12,000	31,000	+ 19,000
,, Netherlands	99,000	22,000	– 77,000
Cells and batteries :			
Total	1,030,000	1,127,000	– 3,000
To Netherlands	19,000	16,000	– 3,000
,, Great Britain	386,000	212,000	– 174,000
,, Japan	202,000	7,000	– 195,000
,, Russia	*	399,000	—
Switchboards, fitted—			
Total	286,000	328,000	+ 42,000
To Poland	14,000	55,000	+ 41,000
,, Finland	7,000	22,000	+ 15,000
,, Asiatic Turkey	*	27,000	—
Wireless telegraph and telephone apparatus—			
Total	692,000	440,000	– 252,000
To Norway	43,000	88,000	+ 45,000
,, Denmark	26,000	50,000	+ 24,000
,, Finland	75,000	62,000	– 13,000
,, Switzerland	233,000	9,000	– 224,000
Panels for telephone switchboards—			
Total	63,000	69,000	+ 6,000
To Egypt	14,000	46,000	+ 32,000
,, Poland	18,000	9,000	– 9,000
Generators and motors, each weighing not more than 50 kg.—			
Total	8,570,000	10,921,000	+2,351,000
To Denmark	498,000	782,000	+ 284,000
,, Netherlands	1,802,000	891,000	– 911,000
,, Belgium	803,000	802,000	– 1,000
,, Great Britain	2,064,000	2,658,000	+ 594,000
,, France	1,079,000	676,000	– 403,000
Generators and motors weighing from 50 to 100 kg.—			
Total	394,000	454,000	+ 60,000
To Norway	25,000	43,000	+ 18,000
,, Finland	29,000	25,000	– 4,000
,, Great Britain	33,000	67,000	+ 34,000
,, Australia	28,000	24,000	– 4,000
Generators and motors weighing from 100 to 500 kg.—			
Total	1,774,000	2,034,000	+ 260,000
To Norway	122,000	185,000	+ 63,000
,, Finland	225,000	183,000	– 42,000
,, Great Britain	186,000	298,000	+ 112,000
,, Spain	228,000	258,000	+ 30,000
,, Australia	140,000	119,000	– 21,000
Generators and motors weighing from 500 to 3,000 kg.—			
Total	1,320,000	1,415,000	+ 95,000
To Finland	118,000	194,000	+ 76,000
,, Belgium	184,000	185,000	+ 1,000
,, Great Britain	145,000	131,000	– 14,000
,, Spain	150,000	111,000	– 39,000
,, British East Indies ...	44,000	29,000	– 15,000
Generators and motors weighing more than 3,000 kg.—			
Total	3,000,000	2,722,000	– 278,000
To Belgium	311,000	291,000	– 20,000
,, Canada	508,000	293,000	– 215,000
,, Finland	140,000	301,000	+ 161,000
,, Great Britain	127,000	78,000	– 49,000
,, Brazil	19,000	108,000	+ 89,000
,, Russia	620,000	865,000	+ 245,000
Transformers weighing from 100 to 500 kg.—			
Total	460,000	889,000	+ 429,000
To Russia	85,000	417,000	+ 332,000
,, New Zealand	21,000	62,000	+ 41,000
,, Spain	62,000	53,000	– 9,000
,, Australia	97,000	68,000	– 29,000
Transformers weighing from 500 to 3,000 kg.—			
Total	421,000	732,000	+ 311,000
To Finland	52,000	67,000	+ 15,000
,, Australia	48,000	152,000	+ 104,000
,, New Zealand	19,000	107,000	+ 88,000
Transformers weighing more than 3,000 kg.—			
Total	1,505,000	1,478,000	– 27,000
To Italy	56,000	270,000	+ 214,000
,, Belgium	165,000	288,000	+ 123,000
,, Great Britain	558,000	8,000	– 550,000
,, Russia	—	535,000	+ 535,000
,, Spain	84,000	13,000	– 71,000
,, Australia	—	162,000	+ 162,000
Incandescent lamps : Metal filament—			
Total	73,000	328,000	+ 255,000
To New Zealand	1,000	54,000	+ 53,000
,, Denmark	3,000	18,000	+ 15,000
,, Finland	52,000	73,000	+ 21,000
,, Australia	6,000	167,000	+ 161,000
Starting, regulating and reduction resistances, &c.—			
Total	520,000	759,000	+ 239,000
To Finland	83,000	88,000	+ 5,000
,, Spain	68,000	73,000	+ 5,000
,, Australia	23,000	31,000	+ 8,000
,, Russia	43,000	271,000	+ 228,000
Stators, rotors, current collectors, magnet coils, &c., weighing each not more than 50 kg.—			
Total	94,000	103,000	+ 9,000
To Norway	16,000	11,000	– 5,000
,, Great Britain	18,000	29,000	+ 11,000
,, Finland	11,000	21,000	+ 10,000
Oil break switches, hand-operated—			
Total	113,000	247,000	+ 134,000
To Russia	*	76,000	—
,, Finland	19,000	25,000	+ 6,000
,, Japan	1,000	52,000	+ 51,000
Switches, not specified—			
Total	189,000	257,000	+ 68,000
To Russia	*	43,000	—
,, New Zealand	32,000	30,000	– 2,000
,, Finland	35,000	36,000	+ 1,000
,, Belgium	22,000	32,000	+ 10,000
Safety appliances, not specified—			
Total	289,000	516,000	+ 227,000
To Netherlands	28,000	95,000	+ 67,000
,, British South Africa ...	20,000	33,000	+ 13,000
,, Finland	35,000	25,000	– 10,000
,, Spain	24,000	42,000	+ 18,000
,, Australia	49,000	131,000	+ 82,000
,, Poland	27,000	36,000	+ 9,000
,, Russia	*	33,000	—
Telephone apparatus, weighing less than 5 kg. per article—			
Total	796,000	1,240,000	+ 444,000
To Netherlands	96,000	159,000	+ 63,000
,, Argentina	35,000	48,000	+ 13,000
,, Mexico	95,000	80,000	– 15,000
,, Spain	60,000	247,000	+ 187,000
,, China	31,000	74,000	+ 43,000
,, Finland	90,000	119,000	+ 29,000
,, Poland	123,000	241,000	+ 118,000
Ditto, weighing 5 kg. or more—			
Total	1,011,000	1,194,000	+ 183,000
To Finland	123,000	152,000	+ 32,000
,, Poland	98,000	117,000	+ 19,000
,, Egypt	65,000	164,000	+ 99,000
,, British South Africa ...	174,000	107,000	– 67,000
,, China	214,000	103,000	– 111,000
,, Argentina	70,000	123,000	+ 53,000
Telegraph apparatus, telephone switches and switchboards and parts—			
Total	5,736,000	4,575,000	–1,161,000
To Spain	36,000	999,000	+ 963,000
,, Finland	308,000	266,000	– 42,000
,, Russia	20,000	31,000	+ 11,000
,, Poland	211,000	341,000	+ 130,000
,, Netherlands	2,626,000	845,000	–1,781,000
,, British South Africa ...	312,000	277,000	– 35,000
,, Mexico	647,000	241,000	– 406,000
,, Australia	195,000	271,000	+ 76,000
,, China	166,000	142,000	– 24,000
Cables and cords with sheath of lead or other metal; maximum diameter 25 mm.—			
Total	425,000	665,000	+ 240,000
To Poland	107,000	410,000	+ 303,000
,, Finland	*	68,000	—
,, Netherlands	89,000	5,000	– 84,000
,, Spain	36,000	46,000	+ 10,000
Ditto, of greater diameter—			
Total	121,000	542,000	+ 421,000
To Poland	*	266,000	—
,, Peru	*	37,000	—
,, Mexico	66,000	163,000	+ 97,000

*Not specified.

£1=17 kr. (approx.).

Russian Electrical Notes.

The Leningrad Electrical Market.—A message to the *Commercial and Industrial Gazette* from Leningrad says that, owing to the financial difficulties of industry and the curtailment of projected reconstruction works, the receipt of orders for electrotechnical goods has weakened somewhat. The fall in sales of cable manufactures is specially marked owing to the cutting down of the plans for renovations in the electrotechnical industry. Last year the output of the Cable Works was entirely disposed of, but this year a stock of goods has accumulated equivalent to about six weeks' production. The manufacture of power cables is in full swing, not being at all affected by the slackness in other branches. Installation material has been affected by the same causes as cable manufactures, and instead of the whole of the production being sold, as last year, not more than 50 per cent. is now being sold. The demand for electric lamps has also declined. From April to August this year there was an almost uninterrupted falling off in the turnover of the Leningrad branch of the "Get." In July sales were 25 per cent. lower than in March. The summer slackness in 1925 was not nearly as marked as it has been this year, and only affected the months of April and May.—*Reuter's Trade Service* (Moscow).

Facilities for Foreign Firms.—The Soviet Government has published a decree granting certain advantages to foreign constructional enterprises. These enterprises are allowed to tender for all publicly offered contracts for the construction of dwellings, factories, railways, ports, &c. The importation of the machinery and tools will be exempt from duty. The use of foreign constructional material is permitted under certain conditions. The concessionary firms will be allowed to send skilled workers to Russia, and as regards taxes, they will be placed on the same level as Russian contractors.—*Reuter's Trade Service* (Moscow).

Production in 1926-27.—The State Planning Commission has approved the revised figures respecting the estimated production of the electrical manufacturing industry in 1926-27. The figures show a computed output of the value of 125,020,000 pre-war roubles (£12,502,000), or 36 per cent. more than in the current year. As compared with the year 1924-25 the increase indicates some reduction, which in general applies to the construction of machines owing to the insufficient size of the works, and to the manufacture of lamps consequent on the slackening of the demand. In general it is possible to foresee that the demand for machines, transformers, apparatus, copper, h.p. porcelain, and installation materials will not be fully covered by the home production. It is proposed to increase the number of workmen by 19 per cent. to 30,500; the productivity of labour is expected to be increased by 13 per cent. on account of the improvement in the equipment, rational production and partly by intensified working; and the cost of production is to be reduced by 6 per cent. The scheme provides for a capital expenditure upon existing manufacturing works amounting to 12,400,000 roubles, rising to 20,000,000 roubles, including new works, of which 16,844,000 roubles is to be provided by the State.

Central Station Developments.—A report has been presented to the Council of the People's Commissioners (the actual Government) and the Council of Labour and Defence, which ranks next, giving an extract of the revised figures concerning the national industry in the coming year (1926-27). In the case of the central station industry it is mentioned that the depreciated condition of the machinery and plant is such that it is necessary to install every year new plant to the extent of 300,000 kW to deal with the growing consumption. This year it was proposed to lay down 280,000 kW, and next year it is intended to install a further 250,000 kW. The delay in the allocation of orders this year may, however, render it necessary to carry over plant of 80,000 kW for execution in 1926-27. The general expenditure on electrification works next year is computed at 160,000,000 roubles, of which it is proposed to provide 90,000,000 roubles in the budget, while the balance is to be raised by means of credit and the utilisation of the funds of consumers.

Manufacture of Cables.—The General Electrical Commission has drawn the attention of the Supreme Council of National Economy to the scarcity of various raw materials in the current quarter for the manufacture of cables. These concern particularly copper, dynamo and transformer iron, armouring, paper and chemical products, the lack of which will prevent the due execution of orders.

Electrification of the Caucasus.—It is proposed to carry out a large scheme of expansion in the north of the Caucasus during the next five years. According to a report presented by the General Electrical Commission to the State Planning Commission, the scheme comprises the construction of five regional stations (Shaktinska, Mineralovodska, one on the river Beloi, Novorossinska, and Grosny), of a total capacity of 147,000 kW; two local stations (Konstantinovska and Gizeldon), of a capacity of 11,500 kW, and several rural stations, each of 3,000 kW, representing a total of 12,000 kW. At the end of the period of five years it is intended to begin the establishment of a 60,000-kW station at Kuban. Excluding the last station the expenditure on the works in the five years is estimated at 70,200,000 roubles, of which the general State budget will be required to provide 41,000,000 roubles, while the balance will be raised by the localities concerned.

The Leningrad Electricity Supply.—The attention of the Supreme Council of National Economy has been directed to the serious situation of the electricity supply system in Leningrad. It appears that the city has been supplied in the past few years from five central stations and a number of "block" stations or generating plant installed at different establishments. The total capacity of the five stations, which are in the hands of the Elektrotok, amounts to 99,860 kW, and that of the 119 block stations to 75,673 kW. But it is far from possible to utilise the whole of the capacity of the block stations as the plant is in need of repair, is unable to ensure an uninterrupted supply, and the costs of production are twice those incurred at the central stations. It is therefore suggested that consideration should be given to the question of abandoning the block stations. In the case of the five central stations it is stated that only two sets, each of 10,000 kW, are in a satisfactory condition, the others requiring repairs in some form or other. Under the circumstances the Electric Planning Commission is asked to proceed with a scheme for increasing the capacity of the Krasni Oktyabr station to 100,000 kW.

The First Electric Railway.—Claimed to be the first electric railway in Russia, an electrically-operated line between the petroleum town of Baku, Sabunchi and Surakani was opened for passenger traffic in July. The line is provided with four electric trains each composed of four cars, each car being capable of accommodating 122 persons; and the number of trains is to be increased to six in the near future. The energy for operating the railway is supplied from the power station of the Baku Oil Trust (Azneft).

Diversion of Profits.—The Supreme Council of National Economy has lodged a protest with the Council of Labour and Defence against the diversion for Treasury purposes of the sum of 1,500,000 roubles from the profits realised by the Moscow electricity combination (Moges) in 1924-25. It is considered that this diversion will prevent the expansion of the combination and delay the works of development now in progress.

Proposed New Station at Moscow.—Exploration work is in progress in the coal basin in Southern Moscow with a view to selecting the most suitable site for the erection of a large new station for the supply of electricity to the city of Moscow and environs.

The Volkhoff Station.—It is announced that the laying of the cables between the Volkhoff station and Leningrad has now been completed, the length of the underground line, which in one part lays on the bed of the Neva, being nearly 44 miles. The cables were made at the works of the Sovkabel.

Works in Carelia.—A report from Leningrad dated August 27th announces that the District Bureau of the Supreme Council of National Economy has prepared a five years' plan of electrification for Carelia, proposing the construction of several small stations at an outlay of 1,000,000 roubles. It is also intended to establish a hydro-electric works of 40,000 h.p. on the rivers Kem or Vigna.

The Big Dnieper Scheme.—It is reported that M. Alexandroff, the author of the scheme for the utilisation of the water powers of the Dnieper, and the chief of the American firm (Cooper) which has undertaken to prepare an expert report on the project arrived at Zaporozje at the end of August. He was accompanied by a number of engineers who are participating in the preparation of the scheme.

The Grosny Oil Region.—The Grosny Oil Trust already has in operation three stations of 9,200 kW, which are interconnected by means of overhead 20,000-V lines. As it is intended to electrify the plant at 880 wells in the next five years, plans are being prepared for the construction of a new 20,000-kW station at an outlay of 7,000,000 roubles, and an early beginning is to be made with the erection of two 5,000-kW sets.

The Telephone Service.—*Commerce Reports* states that the Soviet Government plans to consolidate into one Federal service the telegraph, radio, and telephone systems of the U. S. S. R., according to the Commissar of Posts and Telegraphs. The development of communication by telephone will be given primary consideration. On April 1st, 1926, there were only 171,000 telephones in the Soviet Republic. At present, 67 per cent. of these are under the Commissariat of Posts and Telegraphs, and 33 per cent. are under local authorities. Telephones represent the most profitable branch of the commissariat, but they are in a deplorable condition. In some towns telephones have not been repaired for 10 years, and the equipment of nearly all stations is out of date. In rebuilding these stations it is planned to install the automatic system. Interurban telephone lines are increasing rapidly. At the close of the fiscal year ended September 30th, 1925, they extended for 17,000 miles; on April 1st, 1926, their length had reached 22,000 miles. Telephone connections exist between Moscow and Rostov-on-Don, Moscow and Kiev, and Moscow and Kharkoff. During the coming year it is planned to extend lines to Tiflis and Baku.

Electrically-Driven Winches and Cranes.

A New System of Control.

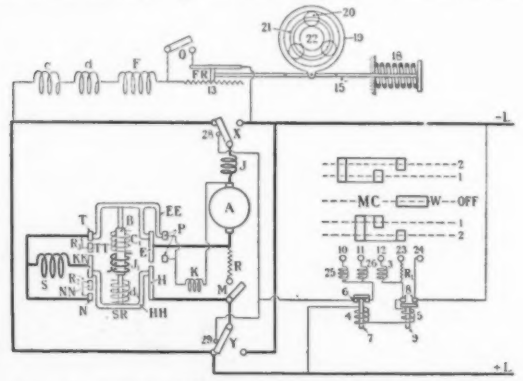
By J. BENTLEY, A.M.I.E.E.

(Abstract of a paper published in the I.E.E. Journal.)

THE paper reviews the conditions which an electric winch or crane should fulfil and the ways in which these can be met. An arrangement of contactors, resistances, and the like, of the author's design, for the control of electric winches under all working conditions is also fully described

In providing an electric drive for a winch or crane to raise and lower loads, the following requirements must be arranged for: To lift the load at suitable speeds; hold the load from running back; allow the load to be lowered under control; prevent the load from being lowered at a speed beyond that at which the centrifugal forces set up in the armature reach a safe limit; take up the slack in the cable without undue strains upon the gear when the slings tighten on the load; drop the load carefully and without damage; drop the load smartly when on the swing, and make it respond to the operator's will as promptly as possible; prevent the motor and gear from being overloaded; prevent the motor from running back or re-starting if the power should fail without the operator's knowledge; and to obtain good acceleration and retardation, thus enabling the cycle of operations to be completed as speedily as possible.

After experimenting with an arrangement of connections for bringing about the above conditions, the author designed the simplified system depicted in fig. 1. The series winding S has sufficient turns to give the required field, when carrying a current within the limits of the motor to produce sufficient torque to resist the full load when the machine acts as a series generator. It has to carry full current only for a short time when starting up, so need only be of small current-



A, armature; S, series winding; F, shunt winding; FR, variable rheostat; O, M, X, and Y, electrically-operated contactors; R, diverter resistance; SR, electrically-operated reverser; E, H, T, N, KK, TT, and NN, fixed contacts; c and d, opposing coils; J and K, contactor operating coils; B, iron core; EE and HH, movable contacts; R_1, R_2, and R_3, resistances; C_1, d_1, and J_1 exciting coils for B; MC, master-controlling drum; 4 and 5, relays; 6, 8, 10, 11, 12, 23, 24, 28, and 29, finger contacts; 25, 26, and 3, operating coils; 9, relay plunger; 7 and 9, relay coils.

Fig. 1.—Simplified System of Electric Crane Control.

carrying capacity. F has sufficient ampere-turns to supply the principal part of the field flux. FR is operated mechanically, but the rheostat moveable contact 13 inserts a resistance in series with the shunt winding F, the maximum resistance being inserted when hoisting or lowering "light hook" and the whole of the resistance being cut out for full load. O when operated makes circuit and cuts out the resistance in FR. X and Y connect to the main (+L) when their operating coils are not energised, either being able to connect to the main (−L) when its operating coil is energised. M makes circuit when operated by the voltage across A. R shunts sufficient current out of S, when M closes, to keep the current within the carrying capacity of the winding. B is mechanically connected to, but insulated from, EE and HH. When c_1 d_1 only are excited, B takes up a central position, the moveable contacts EE and HH, being attached thereto, connect contacts E to TT and H to NN. The current will then pass from A through R_2 and R_3 back to the main (+L or −L) through Y. If J_1 is excited to help C_1, and oppose d_1, B will take up a position between C_1 and J_1. EE will then connect E and T, and HH will connect H and KK, passing the current in the series winding in a prearranged direction so as to help F. If J_1 is excited to help d_1 and oppose C_1, B will take up a position between d_1 and J_1, and EE will then connect E and KK, and HH will connect H and N, passing the current through the series winding S in the opposite direction. Relay 4 breaks 6 when the line voltage is exceeded by a predetermined amount, and relay 5 breaks contact 8 when the line voltage fails. Coils 25, 26, and 3 are connected across the mains through 28 and 29. When MC is in one of the running positions, each of the coils is energised in turn according to the position of the master-controller contacts.

R_1 has an ohmic value equal to that of coil 3. The motor is controlled in the following manner: MC, when in the "off" position W, connects 23 and 24. This makes connection through 4 and 5, lifting 9 and connecting 8, enabling 5 to maintain its own operating. Circuit 4 is energised, but its contacts remain connected unless the voltage on the motor exceeds the normal line voltage by a prearranged amount. 25 and 26 are not energised and X and Y remain connecting both ends of the motor leads to the same main (+L), leaving the armature connected across S, acting as a generator should the load tend to revolve the armature. F, C, and d are separately excited across the mains and decide the direction of rotation of the armature. If MC is moved to step 1, 11 and 12 are connected and 26 and 3 are energised, changing over X to connect to the main (−L). The motor is now connected across the mains and FR is short-circuited by O. The armature starts to rotate and, when the voltage across it reaches a predetermined value, K being energised, M makes circuit to

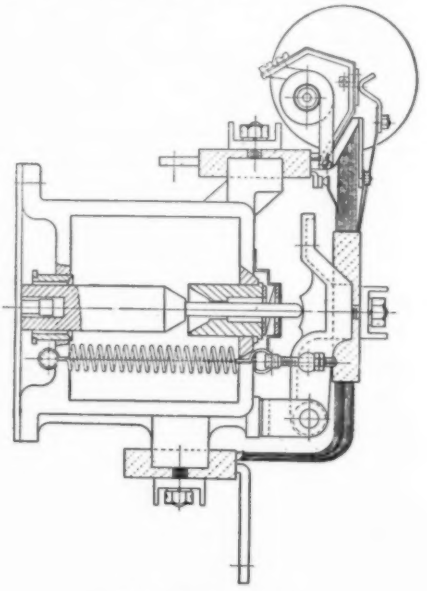


Fig. 2.—Special Contactor.

diverter resistance R, dividing the current between this diverter and the series winding S. It will be seen that the current passing through J in the same direction as through the armature decides which way the current passes through the series winding. The connections are so arranged that S always excites the magnetic circuit of the motor to help the shunt winding.

If the load requires to be driven, the motor takes current from the mains, but if the load is driving the motor, the back e.m.f. rises above the supply voltage and current is returned. If the master-controller is moved to step 2, contacts 11 and 23 are connected, the current passing from main (+L) through 26 to the other main (−L), passing through R_1 instead of 3.

This coil not being energised, O open-circuits any resistance that may be inserted by the FR. This weakens F for any load less than full load, and an increased speed is obtained. If MC is moved in the opposite direction, 10 is connected instead of 11, Y being operated instead of X, and connecting the motor to the main (+L). The current passes through the armature in the opposite direction and reverses the rotation. If the motor is running light, SR remains in the mid-position, there being insufficient current in J to be effective. The current through the armature must therefore pass through R_2 and R_3 instead of through the series winding.

These resistances are adjusted to limit the rush of current to a particular value when starting up the motor without the series winding.

Contacts P are disconnected, so that K does not function and the circuit through R is broken.

If the motor is loaded, the reverser is in one of the extreme positions, and one of the contacts P makes circuit to K, but when the reverser changes over, these contacts are broken and M opens during the change-over.

The coils 25 and 26 are connected to the main (+L) through 18 and 19, so that the circuit to these coils is broken if both X and Y are operating together. Therefore the contactor which is breaking the circuit from main (−L) must connect to main

(+L) before the other contactor can operate to make circuit to main (−L). This gives a delay action during the change-over.

If the voltage fails and the motor is generating, through being driven by the load, then when the voltage across it rises above the line voltage by a prearranged amount, the relay core 7 lifts and breaks contacts 6, disconnecting the circuit to 25 and 26, and X and Y make connection to the same main (+L). The armature is now connected across the series winding and acts as a generator, keeping the load under control.

If the voltage fails under any conditions, S is de-energised and the 9 disconnects and breaks its own circuit. This circuit is made again only by returning the master-controller drum to W, making contacts 23 and 24. The advantages of the method of control may be recapitulated as follows:—

The efficiency of the system is high, since power is returned to the line when lowering the load, and the small gear reduction employed decreases the mechanical losses. Low speed for taking up slack in the cable is obtained without losses in resistances. In tests made upon a winch designed to lift 4 tons at 80 ft. per min., using this system, an overall efficiency of 65 per cent. at full load was obtained. The efficiency remains comparatively high down to about one-quarter full load. Stresses in the mechanical parts are reduced to a minimum. The load is lowered under full control at predetermined speeds, without the wear and tear of a mechanical brake, and, when hoisting, the use of such a brake to prevent the load from running back is avoided. The speeds obtained at light and medium loads are higher with a given size of motor, and the speed range is not limited by the characteristic of the machine. The rates of acceleration and retardation are unusually high, full lowering speed being quickly attained by the application of power, until regenerative speed is reached, while the load is promptly checked and landed carefully and without damage. The copper losses in the motor being heavy, the current is low when the machine is stalled. Fig. 2 illustrates one of the special contactors used.

With regard to the comparative costs of the high- and low-speed types of motor, it must be considered that although that of the low-speed motor taken alone is excessive, the fact that the motor is embodied in the winch, the absence of magnetic brake, &c., and the reduction in the cost of mechanical parts and protective appliances, make the arrangement competitive for a given duty and rating. It is also open to question whether the low-speed machine for intermittent duty cannot be more highly rated for equal reliability since, for instance, the short-circuit current is lower and the motor is thus less likely to be stressed through ill-usage. The author has found that the duty of a crane or winch seldom bears any relation to the rating specified for the motor, and he suggests that the specification should give the required temperature-rise for a duty of so many tons to be transhipped a given distance in a stated number of hours. As the reliability of a low-speed motor is only limited by the permissible temperature-rise, the duty it has to perform should be more closely considered and the limit of temperature-rise more closely approached under working conditions.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Another New Lampholder.

A new type of electric lampholder has recently been put on the market by The British B. A. G. Ltd., Orme Buildings, Parsonage, Manchester. Its principal departure from the usual construction of this apparatus lies in the elimination of connecting screws. Fig. 1 shows the device in section. The flexible lead is finished off under a terminal head in line with, and under the influence of, the same spring as the plunger. A porcelain cap is held hard on the terminal heads by the metal casing and ring. The connecting unit is wired from the underside of the porcelain, the leads being threaded through two small holes. The bare wires are then coiled under the terminal heads which are "lifted" by pressing the plungers up. When the heads are released the wires are held between them and the porcelain. Axial slots in the porcelain then accommodate the leads which are turned upwards, the liner finally being brought into position and the cap screwed down firmly by means of the top ring.

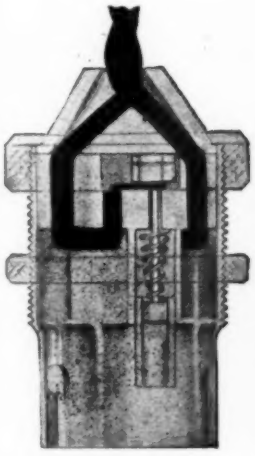


Fig. 1.—New Lampholder (section).

An Improved Pinion Puller.

A new tool designed for the speedy removal of pinions from driving-machine shafts, which should be particularly useful in the case of electric motors, has recently been put on the market by the CONSOLIDATED PNEUMATIC TOOL CO., LTD., Egyptian House, 170, Piccadilly, London, W.1. This device, the "Duff" pinion puller, is of an entirely mechanical nature, and the pulling stress exerted is, it is claimed, more than would ordinarily be required to effectively remove a pinion, however tight the fit. The apparatus weighs only 50 lb., and is equipped with a suitable carrying handle. The appliance consists of a frame-work carrying a set of jaws which engage with the back of the pinion to be withdrawn. Mounted in the frame is a heavy screw which bears on the motor shaft in the usual manner, and which is operated by a worm wheel engaging with a worm shaft at right angles to the main screw, the wheel replacing the usual "nut." The worm shaft is operated by a ratchet and lever element similar to that of the mechanical jack. As the clamps, which are supplied in different sizes to suit varying sizes of pinion, fit completely around the periphery of the pinion, there is no risk of damage to that part. Fig. 2 shows the apparatus mounted on a motor shaft for duty.

Fig. 2.—A Pinion Puller.

A New Circuit Breaker.

The accompanying illustrations, figs. 3 and 4, show respectively the exterior and interior views of a new enclosed type of circuit breaker which has recently been introduced by MESSRS. J. G. SLATER & Co., Queen Anne's Chambers, Westminster, S.W.1. It is designed for loads up to 75 A at 440 V, has a breaking capacity of 100 kW, and is suitable for use on either a.c. or d.c. supplies. The mechanism is of the free-handle type and is operated by an external handle, having a pull and push movement, projecting from the bottom of the cast-iron case. The case is lined with asbestos-slate; cable inlets and outlets are provided and the top and bottom are tapped for 1¼ in. Simplex conduit. The contacts are of the laminated-brush type, giving a pressure-drop across them of from 4 to 8 mV. While the apparatus is standardised with a no-volt release only, space for an overload trip coil is left in the right-hand lower corner of the box, and this addition can be supplied where required. Alternatively, two overload trip coils can be installed. The standard B.E.S.A. range of calibration is given on the overload trip. Mass production is being organised to enable the breakers to sell at prices little in advance of those for switch fuses of the pull-push or similar types.

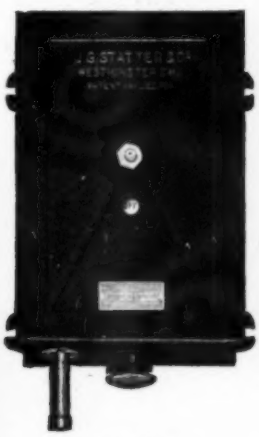


Fig. 3.—Exterior.

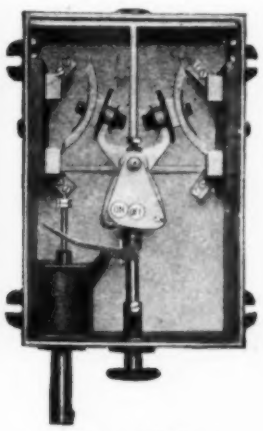


Fig. 4 Interior.

Enclosed Circuit Breaker.

An Electric Radiator Warmer.

A recent production of the MIDLAND ELECTRIC POWER INSTALLATION CO., Old Mill Street, Wolverhampton, is a new form of "Mepic" electric heater, designed for warming motor-car radiators in cold weather to prevent the water freezing. It is constructed in a cylindrical casing mounted in suitable end pieces, by means of which it is fixed at the back of the radiator under the car bonnet, as shown in fig. 5. It is provided with a flexible lead and an adaptor, and is designed for use on ordinary lighting installations. The device is claimed to be absolutely safe and free from any danger in connection with petrol, and we understand that it has been passed for use by various insurance companies.

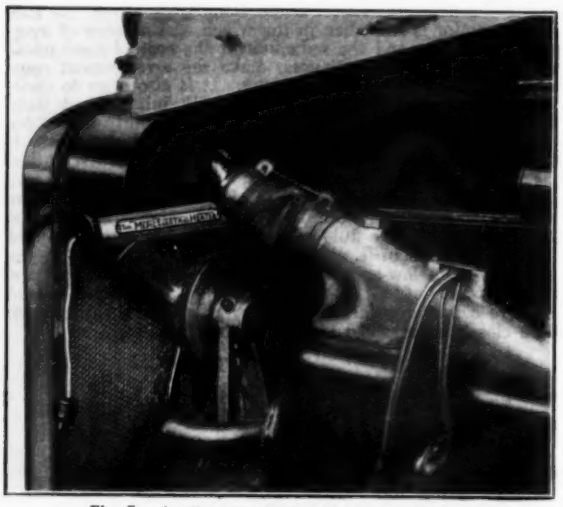


Fig. 5.—Application of the "Mepic" to Radiator.

The sole selling rights for this accessory have been granted to Messrs. J. W. Pickvant & Co., Ltd., Quikko Works, Lombard Street, Birmingham.

An Improved Fuse.

The FOSTER ENGINEERING CO., LTD., Morden Works, Wimbledon, London, S.W.19, has recently made an addition to its range of "Apex" fuses. The new model carries the usual ironclad and interior porcelain features of the older models, the advance being in the provision in the bridge fuse-holder for the fuse wire. A deep, hollow projection of the handle provides an unusually large expansion chamber, and is accommodated by a suitable recess in the porcelain base. The length of the fuse is considerably increased and extends practically the whole length of the bridge, about 3.75 in. The wire is housed in a hole which runs longitudinally through the handle, a portion being exposed in the expansion chamber. The contacts are of the plug-in knife type, substantial strip-copper angle pieces, together with the fuse terminal block, being screwed to the handle. The socket contacts in the base are of a similar construction. An earthing contact is provided on the case. Fig. 6 shows the interior parts of the device.

Fig. 6.—Porcelain Base and Bridge of "Apex" Fuse.

"Special Libraries" Conference.—The Association of Special Libraries and Information Bureaux is holding its third conference during the week-end, September 24th-27th, at Balliol College, Oxford. Viscount Burnham will speak at the opening dinner. Papers are to be read on various problems affecting the collection and distribution of information by experts, including Mr. J. Kaiser, of the Engineering Societies' Library (New York), who will speak on "Systematic Indexing"; Mr. W. A. Cooke, B.Sc., on "Research as an aid to Business Management"; Mr. R. Borlase Matthews, Wh.Ex., on "Information Bureaux," and Mr. P. K. Turner, A.M.I.E.E., on "International Language." The conference is open to all interested; as accommodation is limited, those wishing to attend should communicate without delay with the Secretary of the Association, at 38, Bloomsbury Square, W.C.1.

Electricity in Food Industries.

The Thirteenth International Bakers' and Confectioners' Exhibition.

AT the above exhibition, which was held at the Royal Agricultural Hall, Islington, last week, there was a good representation of the electrical apparatus employed in both the preparation and cooking of bread and the lighter foodstuffs. With progress in the production of food-mixing machinery, increasing advantage is taken of the suitability of electric drive, particularly in respect to the convenient manner in which the electric motor can be housed and incorporated in the construction of the machines. In practically all cases the motor can be fitted to some part of the mixer without increasing the external dimensions of the latter. A large number of firms exhibited electrically-driven machinery of the above description.

The Hobart Manufacturing Co., Ltd., showed a complete range of electric cake mixers with capacities varying from 3 to 80 quarts. All these machines are arranged with the usual direct drive. An electric loaf moulder and a sweet-mixing machine were also seen here. A super mixer was a feature of this stand. This is driven by a motor rated at 2 h.p., and conveniently housed on a platform at the top of the mixer. The motor drives through a friction clutch and a 4-speed drive is arranged through suitable gearing; the machine is supplied with two bowls of 40 and 80 quarts capacities. A sectional model of this apparatus was shown. An interesting piece of equipment, also seen on this stand, a recent production of the firm, was a Kitchenaid. This takes the form of a centrifugal machine mounted on a cabinet. The drive is vertical, the motor being mounted at the head of the machine and incorporated in the framework. It is claimed that, by means of various adjustments housed in the cabinet, any ordinary kitchen operation can be carried out on the equipment, from bread mixing to coffee grinding.

An interesting machine, shown by the Morton Machine Co., was an automatic divider and moulder for small productions such as rolls and buns. This machine employs two separate electric drives, the motors being carried so that no additional working space is required. One motor drives the dividing and moulding elements, the latter being of the oscillating type, and the other is responsible for conveying the eatables, during the moulding process, along an endless table at the rate of from 2,000 to 4,000 per hour. An electric pie machine, which makes the pie shells in the manner of an ordinary pressing machine, was also seen at this exhibit. The die plunger carries a heating element and the shell is half cooked during the moulding operation, which is by a hand lever.

Messrs. Dumbrill Plant & Engineering Co. showed an interesting dough kneader, the "Human," which is belt driven from an electric motor, special provision for the motor being arranged compactly in the base of the machine.

A series of electrically-driven whisking machines were shown by Messrs. T. Melvin & Sons, Ltd. These are all gear-driven, the motor and starting equipment in each case being housed by means of a bracket table on the machine pedestal. Another exhibit here was a dough-rolling machine, in which the driving motor was slung under the rolling table.

Among a series of electrically-driven machines observed on the stand of Messrs. Neulant Pelkman, Ltd., was the "Enpee" supermixer. The motor in this case is mounted on the head of the pedestal and drives the machine through special gearing by means of which the speed can be changed while the machine is running, four speeds being provided for.

The stand of Messrs. Herbst Machinery Co. accommodated a series of electrically-driven whisking machines incorporating the head-drive principle through gearing. Several other firms also showed mixers of the last-mentioned type.

Other electrically-driven apparatus at the exhibition included a dry fruit cleaning machine, shown by Messrs. Caleb Duckworth, Ltd. This equipment is chain driven from a motor bracketed by the side of the fruit-containing cabinet.

Electric baking ovens were fairly well represented.

Messrs. Artofex Engineering Works, Ltd., showed a single-deck, portable, peel-type oven with internal dimensions of 6 ft. long by 4 ft. wide and 11 in. deep. Its maximum loading is 9 kW, 50 per cent. of this being the average loading. The elements are of the mica-insulated strip type, and are arranged in plate form in shallow tunnels at the top and bottom of the oven. They can be inserted and withdrawn from the side of the apparatus. The top and bottom elements are identical and are totally enclosed in sheet metal casings. This construction, it is claimed, renders the elements immune from damage by steam, the oven being fitted with steam injection apparatus. Series parallel control is provided, and a projector-type lamp for internally lighting the oven is arranged for automatic switching with the opening and closing of the oven door. The usual asbestos heat insulation is incorporated, and the oven is tile soled. A number of electrically-driven machines was also seen on this stand.

Messrs. The General Electric Co., Ltd., exhibited a double-tier, peel oven of the type described in the ELECTRICAL REVIEW of July 30th, 1926. This oven is fitted with elements contained in steam-tight tubes running the whole length of the interior of the oven, six tubes being provided at the top and a similar number at the bottom immediately below the tiled sole. Both sections are independently and three-heat controlled. A cover plate is placed in front of each pair of

elements at the top and bottom. The elements may be removed without interference with the interior or contents of the oven by detaching one of the outer cover plates and withdrawing any particular one. The elements are interchangeable for any desired voltage.

A conveyor-type electric oven was seen at the exhibit of the Metropolitan-Vickers Electrical Co., Ltd. (see ELECTRICAL REVIEW, April 23rd, 1926). A ¼-h.p. motor mounted on the oven top drives the conveyor, which is of the endless-chain type. The bread is carried in trays, any of which may be brought to a standstill at the oven door for removal, by means of a tumbler-type control switch fixed on the front of the oven. The motor drives through a reduction gearing, which may be disconnected for hand operation of the conveyor. The oven is heated by 12 elements mounted in a light steel frame fitted with wheels and placed at the bottom of the oven. By removing a detachable panel, the heating elements may be withdrawn for inspection at any time, whether hot or cold. The elements, which are of the heavy-ribbon type, are constructed for low-temperature or black-heat working. The control apparatus is simple and mistake-proof, both automatic and hand temperature-regulating apparatus being fitted. The automatic gear is controlled by a thermostat graduated from 100 deg. to 500 deg. F., and is mounted on a wall near the oven.

The interest of an electric oven displayed by Messrs. Baker Perkins, Ltd., and David Thomson, Ltd., lies in the fact that it is of the steam-type of oven made by the firm converted for electric heating, the steam pipes being replaced by electric elements. These are fitted at the top and bottom. A special metal-type confectionery sole is provided. This firm also showed a range of electrically-driven mixers.

Messrs. Barrons, Ltd., also showed a 3-decker electric bread oven, besides a number of electrically-driven machines.

The Smoke Abatement Exhibition and Conference, 1926.

(*Concluded from page* 438.)

THE Conference was opened on September 7th, at Bingley Hall, when Mr. Will Melland presided and made an official statement on the policy of the League, particularly in relation to boiler smoke. The League had, he observed, come to the conclusion that its ideals could be best promoted by regarding industrial coal consumers as reasonable human beings, and by working with them rather than against them. They recognised that the owners of power plants were making smoke, due in many cases to slackness and ignorance, but also to real difficulties which they could not see their way to solve. Owners of power plants had become very sceptical about apparatus which was offered to them as a means of overcoming their difficulties. He referred to the extraordinary difference which existed between the application of scientific knowledge to the engine house and to the boiler house. The last ounce of knowledge was put into the establishment of an up-to-date engine house, while the boiler house was often run on rule-of-thumb lines.

Mr. A. LINDSAY FORSTER (Messrs. Chance Bros. & Co., Ltd.) proposed that voluntary organisations should be formed in various districts for the purpose of discussing methods for the abatement of smoke in industry. The industrial side of the question was much more amenable to corporate action and voluntary effort than that which related to the domestic fire. These organisations would consist of the industrialists concerned, and they would collect and collate a great deal of important technical information, and also be a safeguard against mischievous legislation. What was wanted was a process of an educative character. The bodies contemplated would further act as a check upon people offering freak remedies for saving fuel and abolishing smoke, and also act as a liaison between industrial fuel users and scientific institutions.

Mr. ROBERTS, of Manchester, urged the need of legislation which would make it impossible for any firm to erect works which dispersed dense black smoke.

Mr. CHARLES ELEY, of Birmingham, said that if the industrial chimneys were connected with a conduit, whereby the hydro-carbons could be burnt and the dust trapped before the resultant was ejected into the atmosphere, there would be no cause for complaint.

Mr. JOHN W. GRAHAM, formerly of Manchester, argued that an amendment should be made in the Smoke Abatement Bill, now before a Committee of the House of Commons, removing the wholesale exemption of all metallurgical trades for an indefinite period, and setting up instead an expert committee of the Ministry of Health empowered to exempt individual works on application for limited periods as might be found necessary.

Councillor A. MUNRO said that in Glasgow they "educated" the owners of excessively smoky chimneys by fining them £5, with the result that over 70 per cent. of the industrial chimneys were smokeless.

Councillor LUCAS, Birmingham, stated that after several months of the coal stoppage the atmospheric pollution in the city was worse than before the stoppage, proving that the quality of coal used was a great factor in the smoke evil.

Mr. HEPWORTH, London, observed that at works of which he was in charge they had tried different kinds of mechanical stokers, and were still "up against" the trouble of grit and smoke.

Dr. OWEN said in Sheffield he had seen high-carbon steel being made by some firms without the emission of smoke, while others similarly engaged sent out huge quantities. The problem was as much psychological as technical.

Dr. DVOZKOVIITZ observed that remedial measures could not be standardised for the whole country.

Bailie W. SMITH, Glasgow, put in a strong plea for the education of politicians, many of whom thought that smoke was necessary industrially.

Mr. C. ELLIOTT (hon. sec.) insisted that the smoke problem should be tackled on national lines.

A paper on "Smoke Abatement in Bengal" was submitted by Mr. J. Robson, who outlined a voluntary scheme sanctioned by the Government for the training and examination of firemen.

Sir NAPIER SHAW, who was re-elected president of the League at the annual meeting on September 6th, alluded with satisfaction to the prospect that the work of the committee for the investigation of atmospheric pollution might be resumed in connection with the Department of Scientific and Industrial Research.

In connection with the Government Smoke Abatement Bill, Mr. ELLIOTT said it was possible that, in conjunction with the Coal Smoke Abatement Society in London, they would arrange for a considerable demonstration against the objectionable features of the Bill.

Mr. GRAHAM moved a resolution suggesting, *inter alia*:—

That the wholesale exemption of metallurgical processes should be omitted from the Bill; that an expert committee of the Ministry of Health, with powers to advise exemption, for limited purposes, of special works, should be constituted; that steamers in Home waters, and Government buildings should not be exempted; and that permissive powers granted to local authorities, with regard to the smokeless construction of new buildings, should be allowed to include private houses; and that, failing these amendments, the Bill should be dropped.

The resolution was referred to the Executive Committee with a view to its taking what action it could in favour of strengthening the Bill.

A reception of members of the League was held at the Grand Hotel on Tuesday night, when Sir John Robertson (Medical Officer of Health for Birmingham) gave an address on smoke abatement and on the great value to health of the ultra-violet rays, which were prevented by the soot cloud and tar from reaching the earth in large quantities. A consequence was that lime salts were not deposited in sufficient quantities in children's bones. The ultra-violet light had a fine tonic effect on consumptives and weakly children. As to industrial smoke, it was now possible for a large boiler installation to be so worked as to produce little, or no, soot or tar, by using a good coal or having an efficient plant with a mechanical feed for a good quality of soft coal. In the case of the smaller installations, the difficulty in ensuring that the stoker would never make a mistake was greater, and he saw no alternative but the use of electricity or gas for power. Many hundreds of such plants had been converted from coal-fire boilers to gas engines or electric motors in Birmingham, with very great advantage to the condition of the atmosphere. It was very important that some uniform standard of control should be adopted for plant of similar sizes. Many standards were in existence, but he knew of none so satisfactory in regard to the amount of smoke emitted as that agreed to by the Sheffield manufacturers 25 years ago for their boiler plants. Of course, the abolition of any such standard must be a temporary measure, for they must aim at the abolition of all smoke. He thought the Electricity Bill would go far to assist in this aspect of the problem.

Sir John added that steam-power users had a relatively easy problem compared with many other users of soft coal. Many of the metallurgical processes were more difficult to control as regarded the emission of black smoke. The forge owners of Leeds, or the high-carbon steel rollers of Sheffield, must have standards of their own. There were many processes in the metal trades which might be better and more economically performed by gas-heated or electrically-heated furnaces.

As for domestic smoke, the cooking range in an ordinary dwelling was the worst offender in producing smoke.

If electric radiators could be used for general heating at approximately the same cost, or even a little more than that of the open coal fire, there was no doubt that that form of heating a dwelling room would oust all others, because of its elasticity in use and its comfort. For the moment, however, electric heating was a luxury for the rich rather than for use by the average artisan. The real problem was how to supply the 85 per cent. of dwellings occupied by the artisan classes with a heating apparatus which would warm the house

and cook the food. For such an apparatus, electricity had not yet become an economical or practical proposition. It was, he added, highly important that those contemplating the erection of any dwelling-house which was to be entirely heated by gas fires or electric radiators should see that they provided a shaft which would ventilate the rooms when they were closed in as efficient a manner as the open chimney did.

Sir John said he anticipated no startling revolution in the methods of domestic heating or in the industrial uses of soft coal. Education of the public as to the damage done by the presence of soot, tar, and acid in the air would do more than anything else to produce pressure and progress. The air of Birmingham was relatively much cleaner than it used to be, notwithstanding the enormous growth of trade and of population. That result had been produced by steady pressure on employers to adopt the best apparatus possible for the elimination of black smoke, and very largely to the Gas and Electricity Supply Committees of the Birmingham Corporation, who had aided the work by a supply of heat and power when needed. He was convinced that the more manufacturers knew of the newer processes of heating the more likely they would be to adopt them, and the same applied to domestic heating apparatus.

There were two addresses on Wednesday—one on "Municipal Housing Schemes," by Mr. E. D. Simon and Miss Marian Fitzgerald, and the other on "Clean Air and Clean Homes," by Dr. Raymond Unwin and Mr. Poynton Taylor, both of the Ministry of Health.

Municipal Housing Schemes.

In this paper the authors observed that opinions differed as to whether the industrial chimney or the house chimney was responsible for the larger share of the smoke which polluted the air. The point was that both kinds of smoke were bad and should be attacked simultaneously as vigorously as possible.

The Smoke Abatement League sent out a questionnaire to 575 local authorities with populations of over 10,000 to ascertain whether, in spite of having neither compulsion nor encouragement from the Government, the local authorities had taken any steps towards minimising smoke from their new houses; 262 forms were filled in and returned. Forty-four per cent. were able to report that the old-fashioned kitchen range had been eliminated in all their houses. A further 20 per cent. reported that they were eliminated in some houses, but not in all; while 35 per cent. had been content to retain the smoky and wasteful apparatus.

A good many authorities had a considerable number of what they called "all-electric" houses. Strictly speaking, they were semi-electric, because they had one coal fire (with oven and back boiler) in the living room. Liverpool, however, had built 250 *all*-electric houses with no coal fire at all.

Several local authorities had a few all-electric houses for demonstration purposes. Some local authorities had put in electric cookers, *e.g.*, Hackney in 114 flats, Lincoln in 50 houses (also electric wash-boilers). In Woolwich, practically all post-war council houses had electric cookers fixed, also plugs in the parlour and bedrooms, the tenants finding the heaters.

It was particularly interesting to note that some quite small U.D.C.'s had adopted this method. For instance, Featherstone, Yorks., with 15,000 inhabitants, and Gellygaer, Wales, with 45,000, both colliery districts, while retaining the Yorkshire range, "because the miners get free coal," had wired their houses so that electrical heating could be used in future. It was somewhat surprising that these smaller councils had made provision for modern methods in the future, when some of the larger corporations had apparently given the matter no attention at all. In Barnsley it was regarded as "impossible to eliminate the open kitchen range because it was a colliery district, but a number of electric cookers had been installed in the larger types of municipal houses and found quite satisfactory by the more intelligent type of tenant." At Cowdenbeath, which was also a colliery district, the kitchen range was eliminated and the houses had a modern cooking grate in the kitchen, gas cookers in the scullery, and gas fires in the bedrooms. The local authority considered it "had gone as far as was reasonably practicable in smokeless methods, bearing in mind that coal was supplied to the miners at a very cheap rate."

Artisan tenants in Lincoln highly appreciated electric cookers.

The authors, in conclusion, pointed out that the questionnaire was sent out mainly with a view to ascertaining what the local authorities were doing as regards reducing smoke from their new houses, and it was hoped that by spreading the knowledge of what the more progressive authorities had found practicable, the Smoke Abatement League would stimulate the others to a certain degree of imitation. But more than that had emerged from the replies.

Clean Air and Clean Houses.

In their contribution on "Clean Air and Clean Houses," Dr. Raymond Unwin and Mr. Poynton Taylor suggested that a better mode of life in cleaner houses and environment under the present conditions of commerce could be best achieved by that factor of town planning known as "Zoning," or the proper use of land in any given known set of circumstances. Where town planning schemes were made by the local authorities, they could allocate certain convenient areas for industrial purposes, and could select areas where any smoke that must be created would do the minimum of injury.

In the issue for August 2nd, 1920, an article, entitled "Smokeless Heating for Cottages," began:—"The necessity for abolishing the smoke nuisance, air pollution, and the waste involved in consuming raw coal is now admitted on all sides, and our present concern must be to devise methods of keeping warm without contributing to these unwelcome conditions. . . . We should look principally to gas and coke as sources of heat. Electricity, unrivalled as an illuminant, is not as a rule economical for heating owing to the waste involved in first converting fuel into mechanical energy." Since this statement was printed much progress had been made in some places regarding the use of electricity for other purposes than lighting, and it was undoubtedly an alternative to be considered.

Electricity was also so economical in use for cooking with the most efficient apparatus that this went far to balance its still higher cost per thermal unit, and where suppliers and local authorities were laying themselves out to supply it cheaply, say, below 1d. per kWh, its use in small dwellings was growing, and might be regarded as a practical, and from a smoke abatement point of view, an ideal alternative to raw coal.

Electricity appeared to be in its infancy as regards its utilisation at reasonable cost for general water heating purposes. Nevertheless, in some places where there were periods of small load, and where current could be supplied during those periods at low cost and the heat stored up in the hot water tank, the use of electricity for heating the water for cottages was proving a practical proposition, and a number of "all-electric" houses had been adopted. There were also appliances for the purpose in which the current was automatically regulated by the temperature of the water, the tank being connected to the required supply points in the usual manner. They did not know of these appliances being used extensively in working-class houses, but rather in places where a little extra cost did not outweigh the increased convenience. It was an ideal method, and one to be watched with interest and hope. Electrically-heated kettles and irons had been supplied to tenants of small dwellings; at least one case was known where tenants re-housed from cleared slum quarters were using those appliances in conjunction with electrical cookers, and expressed great satisfaction at a reduced expenditure compared with their old conditions. The cost of the energy per kWh in that case was one penny. It would appear that as regards smokeless continuous heating for rooms, both coal, gas and electricity were at present too costly for the purpose for working-class houses.

Discussion on Papers by Dr. Simon and Miss Fitzgerald, and Dr. Unwin and Mr. Poynton Taylor.

Attention was called by Bailee Smith, of Glasgow, to the small proportion of new houses already in existence before housing schemes were started. Health authorities could not afford to wait for a clean atmosphere until the whole population had been rehoused.

Mr. Evan Roberts, Junr., Manchester, suggested that smokeless fuel was the best thing for open fires, much better than gas coke.

A strong point was made by Dr. Fishenden that, notwithstanding the advance made by gas mainly, and to some extent by electricity, in regard to the equipment of the domestic house, the amount of raw coal used per head of the population for domestic purposes had not been diminished.

Dr. Owens (Advisory Committee on Atmospheric Pollution to the Air Ministry) observed that low-temperature coal was not necessarily the best way to approach the problem. Why not adjust the grates to burn the fuel they happened to have?

An appeal was made by Dr. des Vaux (chairman of the London Smoke Abatement Society) for the backing of the efforts of that organisation and the Smoke Abatement League to get an amendment of Clause 5 in the new Public Health (Smoke Abatement) Bill, so as to give urban authorities powers to make by-laws requiring the provision in new buildings (including private houses) of such arrangements for heating and cooking as were calculated to prevent or reduce the amount of smoke.

A resolution on these lines was passed *nem con.*

Sir Napier Shaw (who presided at this sitting) urged that the time was not exactly favourable for formulating regulations. In future coal would have to be distilled before it was burned. In future the nature of the by-products in a particular area might have to be considered in making a set of by-laws or regulations.

On Wednesday afternoon the visitors inspected the housing estates and works of the Austin Motor Co., at Longbridge, Northfield, and of Messrs. Cadbury Bros., Bournville.

At the evening session Dr. Leonard Hill (National Institute of Medical Research) spoke on "Ventilation and Heating," and Mrs. Cloudesley Brereton (London) discussed the question—"How the Housewife Can Help the Cause of Smoke Abatement."

Dr. A. W. Smith presided at Thursday's session of the Conference, when the subjects for consideration dealt with scientific progress in the direction of achieving the smokeless production of power and domestic heating.

Two papers of importance were by Dr. Margaret Fishenden (Fuel Section of the Society of Chemical Industry) on "The Outlook for Smokeless Domestic Heating"; and Mr. A. S. E. Ackermann, entitled "The Engineering Aspect of the Smokeless Production of Power."

In introducing Dr. Margaret Fishenden, Dr. E. W. SMITH described her as the first lady technological fuel expert in the

country and recalled her work in Manchester some years ago. The advocacy of smoke abatement should not be left in the hands of the ordinary householder. There was need of an organisation which should be officially representative of the electrical, coal-mining, coke-oven and gas industries, and fuel technologists and economists. In recent years there had been but little reduction in the total quantity of coal used for domestic purposes, but the smoke nuisance was to some extent being abated. It would appear that the coal was being used more efficiently.

The Outlook for Smokeless Domestic Heating.

DR. MARGARET FISHENDEN, F.Inst.P. (for the Fuel Section of the Society of Chemical Industry), who read a paper on this subject, first reviewed the history of the use of coal in Great Britain, and said that in the face of present-day competition, the necessity for utilising our coal supplies with the utmost possible efficiency was of primary importance if we were to retain our prosperity and hold the industrial field successfully against other nations. Since the production of smoke was evidence of incomplete combustion, the general problem of efficient fuel utilisation largely embraced the more special problem of smoke abatement. The average efficiency of the existing boiler plant in the country was certainly below 70 per cent., and it was clearly of great importance in the interests of fuel economy and smoke abatement that this figure should be substantially improved upon.

Although the actual running costs of energy bought as gas or electricity might considerably exceed the corresponding bill for coal sufficient to perform equivalent services, their adoption might in many cases be advantageous. Although the price of a therm in electricity or gas was usually much higher than the price of a therm in coal or coke, if its use should entail a reduction in labour costs, or make possible a more accurate focusing of the heat produced upon the place where it was required, or if it should be instrumental in creating a better (*i.e.*, more valuable) product, it would be commercially sound to use it in preference to a cheaper fuel.

The domestic consumption of coal had risen to about 40 million tons a year, the industrial consumption to some one hundred million tons; but in spite of the difference between these figures, there was good reason for believing that the house chimney was the more mischievous, and if the problem of the domestic fire could be solved satisfactorily, the way to smokeless cities would become relatively easy.

Of all forms of energy into which the potential heat of coal could be converted, electricity was the most convenient on account of its cleanliness, adaptability and ease of control; but, unfortunately, it was also that form of energy in the production of which the wastage of the heat of the coal was most serious. On the basis of initial thermal expenditure in coal, the maximum possible efficiency of any process using electricity as a source of energy was 20 per cent. for the most efficient generating plant or 13 per cent. as an average for the country as a whole. Low grade and comparatively cheap coal, such as would be of little value for any other purpose, could be utilised for the production of electricity in large power stations; but since the available supplies of such coals were limited, any considerable development of power production might involve the necessity of falling back upon more costly raw material.

Since the by-products of the coal were not recovered in the process of power generation, it was clear that the main product, the electrical energy itself must be the sole source of income, and that the revenue obtained from it must cover both expenditure and profits. In view of the low thermal efficiency of its production it was thus inevitable that the price of electrical energy, calculated upon its potential heat-producing capacity, should be very high. As a result, electricity for heating or cooking purposes generally cost the householder about 59d. per therm (2d. per Board of Trade unit), while a high-grade household coal could be procured for 1.7 to 2.1d. per therm (45 to 55 shillings per ton).

At the present time, about eight million tons of coal, only one-fifth the amount burned in domestic grates alone, or about 4 per cent. of the total home consumption, was dealt with annually in our power stations with the production of about 7,500 million Board of Trade units of electricity. Even the most optimistic forecast of the probable rate of expansion of supply undertakings would not lead us to expect any very appreciable immediate amelioration of the smoke nuisance through this agency. The gasworks process involved an aggregate thermal loss equivalent to 20 to 25 per cent. of the potential heat value of the coal treated. The thermal value of saleable gas did not as a rule exceed about 25 per cent., while saleable coke represented 45 to 50 per cent., and tar 5 per cent. For many purposes gas coke was a satisfactory substitute for raw coal, and if they assumed that convenient outlets were to be found for all the coke produced, the effective weight of coal expended in the gas-making process might fairly be regarded as only about 50 to 55 per cent. of the actual amount dealt with, that is, as the total amount less available gas coke. Since on this basis of calculation, gas with a potential heat value of 25 therms might be considered as the return from a net expenditure of 50 to 55 therms in solid fuel, the thermal efficiency of the conversion of coal into gas became 45 to 50 per cent., or, taking account of tar, 50 to 55 per cent. These were the figures upon which must be based calculations of the inroads into our national fuel supplies consequent upon the substitution of town's gas for solid fuel.

The consumer of gas was mainly interested in obtaining the maximum number of heat units at the lowest possible cost; the price of gas on a thermal basis, however, was high in relation to that of coal. Neither gas nor electricity showed to the best advantage for continuous heating, since for intermittent use the fact that either could be turned on or off at will resulted in a substantial reduction in the amount of heat required as compared with that necessary from a continuously burning coal or coke fire. Again, electric heaters were portable, and since they could be placed in any convenient position, they were often able to keep the occupants of a room comfortably warm by the emission of less radiant energy than would be required from a more distant coal fire, necessarily situated on the hearth. Since the use of solid fuel involved a great deal of work, gas fires for periodic use aggregating only a few hours a day, generally proved in practice decidedly cheaper than either coal or coke fires; and even electric heaters, by their convenience and adaptability, might sometimes repay the higher cost of the units dissipated. Where energy could be obtained for less than 1d. per unit, electricity might be regarded as a serious rival of coal for intermittent heating. For continuous heating the cost of gas was very high, and that of electricity quite prohibitive, in relation to the cost of solid fuel.

For the production of heat, electricity, except in certain special cases, might be regarded as a luxury, though its adoption for cooking purposes, was likely to increase more rapidly. For cooking and warming rooms occupied for only a few hours each day, coal gas would undoubtedly be increasingly adopted; but its relatively high cost for water heating or for warming continuously-occupied rooms prevented its exclusive adoption for all purposes, and the demand for a cheap solid fuel was likely to persist. The problem was therefore the production of a satisfactory smokeless substitute for raw coal, which, used in conjunction with gas and electricity, would make feasible the elimination of the domestic smoke nuisance.

Discussion on Dr. Fishenden's Paper.

In the discussion Mr. ROBERTS (Manchester) urged that efforts should be directed towards reducing the size of flues as much as possible, and suggested that the reduction in smoke from domestic fires lay in improved flue construction.

Dr. OWENS (London) suggested that the function of domestic heating appliances extended beyond the mere consideration of heating efficiency, and he pleaded for a wider outlook upon this point.

Councillor MUNRO (Glasgow) observed that in Glasgow they were selling smokeless coal at less than the price of ordinary coal.

Dr. J. T. DUNN (Newcastle) expressed the opinion that low temperature coke was better than any other coke for domestic use. He believed that when it became available it would be rapidly and generally adopted.

The Engineering Aspect of the Smokeless Production of Power.

This subject was dealt with by Mr. A. S. E. Ackermann, B.Sc.(Eng.), F.C.G.I., A.M.Inst.C.E. After enumerating the principal factors in the smokeless production of power, the author mentioned an inquiry conducted by the Coal Smoke Abatement Society in 1914, which showed that many firms which had been called to account for producing smoke and had taken steps to improve their methods, had benefited by the economy resulting therefrom. One manufacturing company had effected a saving of over 1,000 tons of coal a week, and the Central London Railway had saved 500 tons a week. Nowadays an efficiency of 90 per cent. was attainable with boilers fired with gas or with pulverised fuel, but many boilers in this country showed an average efficiency under 60 per cent. At the Langerbrugge power station, near Ghent, three water-tube boilers having a joint capacity of 72,200 lb. of steam per hour worked at a pressure of 800 lb. per sq. in., the air supply to the furnaces being preheated by means of the flue gases to 360 deg. F., and the feed water by live steam to 384 deg. F. At the Dover Corporation electricity works a novel form of pulverised-fuel furnace had been installed by the Lindley-Duffield Co., in which the particles of ash were fused into slag which escaped in the liquid form; a thermal efficiency of 83 per cent. was attained with Kent coal containing 15.4 per cent. of ash, without the emission of smoke.*

With regard to water power, probably not less than 500,000 h.p. was obtainable from this source in Great Britain. The full utilisation of this would result in the saving of 1,607,000 tons of coal per annum.

Before the war the author carried out very complete tests of the two largest sun-plants that had ever been constructed, at Tacony, Philadelphia, and at Meadi, near Cairo. The latter plant produced enough steam to supply 65 b.h.p. for eight or nine hours a day. There were places in the Empire, in Egypt, America, and even in Europe, where such plants would work well. It was almost certain that the vast supply of solar energy would be used in the future.

The more electricity was used for power purposes the less smoke there would be, not that electricity was as a rule produced without the use of coal, but because when it was produced in bulk the firing arrangements were such that little or no smoke was made. When electricity was not obtained from a large central station, it meant that each works was producing its own power, probably smokily, from coal. Electricity, however, was inherently uneconomical for heating purposes, though it was very convenient for certain processes requiring heat.

A good case based on sound thermal—and therefore, possibly, business—principles could be made for generating stations no

*ELECTRICAL REVIEW, April 16th, 1926.

larger than had been in use for the last 20 years, provided they were combined with hot-water distribution systems to neighbouring laundries, hospitals, hotels, public baths and the like, and even to private houses. Roughly 60 per cent. of the thermal value of coal when used in a steam-boiler-engine system was carried away in the circulating water. At the laundries, hospitals, &c., coal, gas, and oil were used for warming water, and in many instances these institutions were close alongside a power station. In one such case that he had in mind the swimming baths were shut because of the coal shortage, and near by was a group of these cooling towers dissipating 60 per cent. of the heat value of the scarce coal into the air. In America the condenser heat had been used in the manner indicated for many years, and small indications of similar action could be found here.

Another wicked waste of heat, and therefore coal, was taking place at gas works on account of the very high temperature at which flue gases were discharged from the retort furnaces. The obvious thing to do was to place an electric light works on top, so to speak, of the retort house of every large gas works. It was a pity that a certain natural antagonism between gas and electricity companies had so far probably prevented this from being done. An enterprising financial group was needed to start a new company which should supply both gas and electricity; then we should have an efficient combination and a great saving of coal.

Discussion on Mr. Ackermann's Paper.

Dr. E. W. SMITH remarked the author had apparently held out hopes of what might be done in a combination of gas and electric works in the utilisation of waste heat from the retort furnaces. It was, however, only in the larger works and those of moderate size where the quantity of waste heat was sufficient to justify the capital expenditure. If a gas works could use its waste heat from the retort settings it would not produce quite enough steam for its own purposes.

Mr. E. ROBERTS, Junr. (Manchester) mentioned that experience with the use of pulverised fuel had been very unfortunate, it had resulted in some of the Lancashire works blowing out a tremendous amount of grit.

Mr. E. KILBURN SCOTT (London) pointed out that the Woolaston gas-producing plant gave all the time it was working 18 per cent. to 19 per cent. of CO_2, which no other arrangement could do. This was remarkable when one considered that the bulk of the boiler plants gave less than 10 per cent. of CO_2.

Commander J. H. NEWSOME (Harrogate) stated that a central heating scheme in that town, which cost £10,000, using oil fuel, had to be scrapped because the use of the water by the hotels, &c., would not justify the expense, and the oil produced an inordinate amount of smoke. They therefore went back to the use of coal, and produced electricity economically.

The author briefly replied.

Trade-Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 8th :—

Turbax. No. 471,893. Class 6. Electric clothes-washing machines.—Turbax (Great Britain and Ireland), Ltd., Fitzalan House, Arundel Street, W.C.2.

Blic. No. 471,645. Class 6. Magneto-electric ignition apparatus, dynamos, electric motors, electric engine starters, and parts of such apparatus. No. 471,646. All goods in Class 8. No. 471,648. Class 18. Electric lighting sets for motor vehicles.—British Lighting and Ignition Co., Ltd., Birmingham.

Gullever. No. 472,138. All goods in Class 6. Mavor & Coulson, Ltd., Glasgow.

Wuncell. No. 466,825. Class 8. Thermionic valves.—A. C. Cossor, Ltd.

Triunicome. No. 470,281. Class 8. Instruments and apparatus for use in radio-telegraphy and telephony.—Igranic Electric Co., Ltd.

Kuk-E-Mum-Pup. No. 470,500. Class 8. Loading coils for radio-telephonic crystal receiving sets.—A. L. Kemp, High Road, Byfleet, Surrey.

Radiodyne. No. 471,029. Class 8. Radio-telephonic and telegraphic apparatus.—Radiodyne, Ltd., 110, Greyhound Road, Hammersmith, W.

Derenco. No. 471,186. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—A. H. Hughes, Eckington Road, Coal Aston, Sheffield.

Capacigrad. No. 471,465; Kilograd. No. 471,466; and Isograd. No. 471,467. All goods in Class 8.—The Rothermel Radio Corporation of Great Britain, Ltd.

Secrophone. No. 471,600. Class 8. Attachments to telephonic transmitting instruments to enable the interruption of telephonic messages without breaking the transmission circuit.—E. E. Rouse, 21, Leamington Road Villas, Bayswater, W.11.

Neutroformer. No. 471,628. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—Hazeltine Corporation, Jersey City, U.S.A. (British representatives, White, Langner, Stevens and Parry, Jessel Chambers, 88-90, Chancery Lane, W.C.2).

Ethotron. No. 471,705. Class 8. Gas discharge tubes and rectifiers.—Burndept Wireless, Ltd.

Donex. (lettering and design). No. 471,985. Class 8. Instruments and apparatus for use in radio-telegraphy and telephony.—H. Soley & Co., 3, Jewin Street, E.C.1.

Nightingale.—No. 471,989. All goods in Class 8.—E. P Murray, 30, Princes Parade, Church End, Finchley, N.3.

Virclad. No. 471,990. Class 8. Electric cables.—Electric Cables, Ltd., 88, Golden Lane, E.C.1.

Simplodyne. No. 472,020. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Elstree Radio Co., Ltd., Bush House, Strand, W.C.2.

Rely-A-Bell. No. 466,003. Class 13. Electric switches, contacts, and terminals.—Rely-A-Bell Burglar and Fire Alarm Co., Ltd., 49a, Wilson Street, Finsbury, E.C.2.

Raydo. No. 469,343. Class 13. Electrical hair brushes.—M. F. Pratt, 7, Wybert Street, Munster Square, N.W.1.

Meracol. No. 471,643. Class 18. Electric heating and cooking appliances.—Thermopath Co., Ltd., 131, Lupus Street, S.W.1.

Published Specifications.

Compiled expressly for this journal by patent agents. The name of the applicant's patent agent, if any, will be found on the printed specification. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1925.

4,196. "Electrical discharge tubes." J. Risler. February 15th, 1924. (229,341.)

7,657. "Wireless receiving sets." J. Wilcockson and H. W. Roberts. March 21st, 1925. (256,998.)

10,453. "Apparatus used in the tuning of wireless circuits." R. L. Aspden. April 22nd, 1925. (256,999.)

12,627. "Synchronous telegraph systems." Muirhead & Co., Ltd., F. H. Muirhead, E. S. Heurtley and J. V. Foll. May 14th, 1925. (257,001.)

12,825. "Electric accumulators." W. Haddon. May 16th, 1925. (257,002.)

12,838. "Devices for coupling thermionic valve circuits." L. M. Robinson. May 16th, 1925. (257,003.)

12,987. "Automatic telephone systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Ltd.) and A. J. Chanter. May 19th, 1925. (257,007.)

12,988. "Automatic and semi-automatic telephony." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.), R. A. Moir and G. C. Hartley. May 18tn, 1925. (257,008.)

13,055. "Electrical switchgear." A. Reyrolle & Co., Ltd., and F. Coates. May 19th, 1925. (257,010.)

13,057. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. May 19th, 1925. (257,011.)

13,122. "Electric contactors or circuit-breakers." A. Reyrolle & Co., Ltd., and B. H. Leeson. May 20th, 1925. (257,014.)

13,223. "Wall plug and like connections for electric supply circuits." A. W. Butterfield and Mycromet Manufacturing Co. May 20th, 1925. (257,017.)

13,225. "Storage batteries and process of producing same." G. F. Downer. May 20th, 1925. (257,019.)

13,236. "Electromagnetic induction heating." C. R. Burch, N. R. Davis, and Metropolitan-Vickers Electrical Co., Ltd. May 20th, 1925. (257,021.)

13,338. "Variable electrical condensers, variometers, or like adjustable devices in wireless apparatus." T. Harper. May 21st, 1925. (Cognate application 26,607/25.) (257,028.)

13,365. "Ventilation and cooling of electromagnetic coils for dynamo-electric machines of the salient pole type. F. P. Fletcher. May 21st, 1925. (257,029.)

13,513. "Electric relay devices." J. P. Keith, J. Cruwys, and Power Equipment Co., Ltd. May 23rd, 1925. (257,031.)

16,476. "Electrical condensers." W. J. Cole and Telegraph Condenser Co., Ltd. June 26th, 1925. (257,051.)

16,676. "Acoustic amplifying, radiating, and diffusing means suitable for use with telephonic receivers and other sound producing or reproducing apparatus." E. A. Graham (deceased). June 29th, 1925 (257,053.)

16,815. "Electric welding process and apparatus." G. B. Ellis (T. E. Murray). June 30th, 1925. (257,055.)

17,863. "Electric rheostats." Crompton & Co., Ltd., and W. F. Jones. July 13th, 1925. (Cognate applications 19,288/25 and 22,720/25.) (257,064.)

18,189. "Decoration of electric incandescent lamps and bulbs." Z. Hadnagy and V. G. de Christian. July 16th, 1925. (257,067.)

19,175. "Telephonic repeating systems." Standard Telephones & Cables, Ltd. (formerly Western Electric Co., Ltd.). (Bell Telephone Laboratories, Inc.). July 28th, 1925. (257,079.)

19,188. "Method of utilising dielectric substances." A. Joffe. July 28th, 1925. (257,080.)

19,326. "Apparatus for electric formation of oxides of nitrogen." J. S. Island. July 30th, 1925. (257,083.)

19,965. "Electric switches and switchgear." Switchgear & Cowans, Ltd., and G. H. Neep. August 8th, 1925. (257,086.)

20,015. "Fusible electric cut-outs." W. T. Henley's Telegraph Works Co., Ltd. P. Dunsheath and H. C. Hoban. August 8th, 1925. (257,088.)

20,523. "Automatic electric switches." C. L. I. Manufacturing Co., Ltd., and J. A. Laird. August 15th, 1925. (257,094.)

21,724. "Inspection conduit fittings for electric wires, cables, or the like." E. Hanff. August 31st, 1925. (257,100.)

21,972. "Electron discharge tubes." Siemens-Schuckertwerke Ges. and Dr. L. Szilard. September 3rd, 1924. (239,518.)

23,181. "Wireless valves." W. E. F. Thomson. September 17th, 1925. (257,107.)

24,943. "Combination switches." Soc. Anon. Lumino. October 6th, 1924. (240,797.)

25,000. "Time element systems for controlling electric circuits." British Thomson-Houston Co., Ltd. October 9th, 1924. (241,202.)

25,252. "Transformers for use with electric welding machines." Soc. Anon. des Ateliers de Secheron. December 23rd, 1924. (245,069.)

26,192. "Radio-frequency amplifying system." L. L. Jones. October 20th, 1925. (257,122.)

26,934. "Filaments for electron discharge devices." Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Bell Telephone Laboratories Inc.). October 27th, 1925. (257,125.)

29,925. "Means for operating tuning dials for radio receivers." W. P. Heath. November 26th, 1925. (257,138.)

30,219. "Electrolytic method of obtaining an adherent burnish on rustless iron or steel." W. A. F. Planhauser and Langbeing-Planhauser-Werke Akt. Ges. November 30th, 1925. (257,140.)

30,374. "Inductance coils for wireless receiving sets." L. Kremner. December 1st, 1925. (257,142.)

31,906. "Electric motor speed control mechanism." British Thomson-Houston Co., Ltd. December 19th, 1924. (244,794.)

1926.

2,348. "Electric switch arrangements for signalling devices on power vehicles." H. Kreidel. January 27th, 1925. (246,839.)

3,041. "Alternating-current induction motors." B. Heger. February 13th, 1925. (Addition to 234,048.) (247,548.)

3,395. "Rectifying and filtering systems for electric current supply." Marconi's Wireless Telegraph Co., Ltd. February 6th, 1925. (247,213.)

3,765. "Electrically-driven rotary pumps." Drysdale & Co., Ltd., and J. Young. February 10th, 1926. (257,169.)

5,034. "Diaphragms for the reception and conversion of sound waves." W. L. Walker. February 22nd, 1926. (257,173.)

7,072. "Electric relays." General Railway Signal Co. March 19th, 1925. (249,511.)

8,464. "Automobile head lamps." J. Borel. October 31st, 1925. (257,190.)

9,148. "Variable electric condenser." B. Jirotka April 25th, 1925. (251,254.)

10,941. "Method of voltage regulation for alternating-current circuits." International General Electric Co. Inc. April 30th, 1925 (251,622.)

11,091. "Electron discharge tubes or thermionic valves." Naamloose Vennootschap Philips Gloeilampenfabrieken. May 11th, 1925. (251,971.)

11,387. "Electromagnetic sound-reproducing apparatus." Brandes Laboratories Inc. November 28th, 1925. (257,203.)

11,444. "Telephone ear-piece, more particularly for wireless purposes." S. Dyhr. April 30th, 1926. (257,204.)

12,905. "Electric lamps." British Thomson-Houston Co., Ltd. May 22nd, 1925. (252,381.)

14,812. "Vapour lamps." E. Ansell and B. G. May. June 12th, 1925 (257,214.)